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Analytical View of Railway Accidents. By F. G. P. Neison, Esq., *Honorary Secretary.*

[Read before the Statistical Society, 18th April, 1853.]

The unusual degree of public attention recently directed to the nature, cause, and extent of railway accidents, has induced me to submit the present paper to the consideration of the Society. The vital importance of the railway system to the commercial and social interests of this country, and its rapidly increasing magnitude, threatening to absorb every other means of intercommunication, render an investigation into the causes of accidents in railway traffic, and their effect on the loss of life and limb, one of no ordinary importance.

In order to accomplish as complete an analysis as possible of what will immediately appear to be a very complicated question, there has been embraced in the present inquiry the whole of the information contained in the documents issued by the Railway Department of the Board of Trade, from the 7th of August, 1840, until the most recent return, which brings the results down to the 1st of January, 1853.

Before entering into the inquiry as to the nature of accidents, it will be necessary to understand the extent of railway communication, and the degree to which the public have availed themselves of it.

The following table shows the number of miles open to traffic at various dates since the month of August, 1840:—

TABLE I.

DATE.	Miles open to Traffic.	Periodical Increase of Railway Communication.
		Miles.
August, 1840	1,330	
31st December, 1840	1,556	226 (increase of 5 months).
,, 1841	1,717	161 (increase of 1 year).
,, 1842	1,857	140 ,,
,, 1843	1,952	95 ,,
,, 1844	2,148	196 ,,
30th June, 1845	2,343	195 (half-yearly).
,, 1846	2,765	422 (increase of 1 year).
,, 1847	3,603	838 ,,
,, 1848	4,478	875 ,,
,, 1849	5,447	969 ,,
,, 1850	6,308	861 ,,
,, 1851	6,698	390 ,,
,, 1852	7,076	378 ,,
31st December, 1852	7,336	260 (half-yearly).

From the third column of the above table, it will be seen that the five years immediately succeeding the 30th of June, 1845, were a period of the greatest activity in the construction of railways, nearly 4,000 miles having been opened to traffic in that time, or upwards of one-half of the whole extent of railway communication. The maximum extent of railway opened for traffic in any one year was in 1849; since then much less activity has prevailed, and the number of miles opened has gradually declined every year down to 1852. However satisfactory this activity and energy in developing the railway system may appear, it still contrasts very disadvantageously with the progress of our neighbours in the United States of America. From the seventh census, printed by order of the House of Representatives, it appears that

ABSTRACT A.

	Number of Miles open to Traffic.	Number of Miles in Progress.	Total Miles.
On the 1st of January, 1852	10,843	10,898	21,741
On the 1st of January, 1853	13,266	12,681	25,947
Increase in 1 year	2,423	1,783	4,206

This active spirit of railway extension is not confined to one or two of the States; but appears to be to a greater or less extent characteristic of at least twenty-one of them.

The following table contains a large amount of information on the extent of passenger traffic on the railways of this country; viz.:—

(*a.*) The average fare per mile for each class of passengers for each year since the 7th of August, 1840.

(*b.*) The number of passengers of each class who have travelled during each year.

(*c.*) And the amount of money received for passenger traffic from each class during each year.

TABLE II.

DATE.	Average Fare per Mile, in Pence.				Number of Passengers.					Receipts in £.					
	1st Class.	2nd Class.	3rd Class.	Pary.	1st Class.	2nd Class.	3rd Class.	Parliamentary.	All Classes.*	1st Class.	2nd Class.	3rd Class.	Parliamentary.	All Classes.	
7th August to Dec. 31st, 1840	2·516	1·826	1·297	..	..	..	..	..	6,027,866	..	..	..	..	756,810	
June 30th, 1841	2·516	1·826	1·297	..	1,530,040	4,144,169	2,357,745	..	9,122,816	281,088	231,046	68,515	..	1,145,386	
„ 1842	2·503	1·803	1·249	..	2,926,980	7,611,966	5,332,501	..	19,000,000	..	..	..	..	2,970,000	
„ 1843	2·490	1·780	1·201	..	4,276,540	11,198,512	6,431,911	..	23,466,896	1,374,942	1,288,758	411,382	..	3,110,257	
Average Fare of the 4 years	2·506	1·809	1·261	..	8,733,560	22,954,647	14,122,157	..	57,617,578					7,982,453	Totals.
June 30th, 1844	2·349	1·699	1·145	..	4,875,332	12,235,686	8,583,085	..	27,763,602	1,432,688	1,375,679	483,069	..	3,439,294	
„ 1845	2·212	1·588	·968	..	5,474,163	14,325,825	13,135,820	..	33,791,253	1,516,805	1,598,115	651,903	..	3,976,341	
„ 1846	2·008	1·465	·953	·926	6,160,354	16,931,065	14,559,515	3,946,922	43,790,984	1,661,898	1,937,947	738,474	293,732	4,725,216	
„ 1847	2·046	1·414	·877	·905	6,572,714	18,699,288	15,865,310	6,985,493	51,352,163	1,675,759	2,048,080	737,452	539,977	5,148,002	
Average Fare of the 4 years	2·143	1·529	·987	·916	23,082,563	62,191,864	52,143,730	10,932,415	156,698,002	6,287,150	6,959,821	2,621,898	833,709	17,288,853	Totals.
June 30th, 1848	2·089	1·695	·953	·939	7,190,779	21,690,510	15,241,529	13,092,489	57,965,070	1,792,533	2,352,153	661,038	902,851	5,720,382	
„ 1849	2·217	1·614	·982	·952	7,078,690	23,392,450	14,378,376	15,432,457	60,398,159	1,889,646	2,502,588	651,366	1,059,786	6,105,975	
„ 1850	2·183	1·584	·951	·933	7,734,728	24,226,608	15,547,749	19,249,974	66,840,175	1,969,247	2,594,817	688,407	1,211,634	6,465,576	
„ 1851	2·103	1·531	·929	·913	9,175,781	28,933,044	16,990,073	23,820,723	78,969,623	2,212,799	2,847,469	714,480	1,402,593	7,177,341	
Average Fare of the 4 years	2·149	1·568	·953	·933	31,179,978	98,242,672	62,157,727	71,595,643	264,173,027	7,864,225	10,297,027	2,715,291	4,576,864	25,469,274	Totals.
June 30th, 1852	2·126	1·550	1·023	·905	10,143,442	30,967,913	15,642,137	29,973,553	86,758,997	2,389,971	3,010,921	662,230	1,809,163	7,984,652	
Dec. 31st, 1852	2·035	1·486	·947	·901	5,859,214	17,524,051	9,522,313	16,962,553	49,886,123	1,308,973	1,630,349	440,916	919,986	4,354,831	
									615,133,727					63,080,063	Grand Total.

* All Classes is not the total of the four preceding columns, but includes Mixed Trains, and also Holders of Periodical Tickets.

From the above table it appears that, in the year ending the 30th June, 1842, the total number of passengers travelling by railways was 19,000,000; but in the year ending the 30th of June, 1852, just ten years after, the number of passengers was no less than 86,758,997, being an increase of about 457 per cent., while, in the same ten years, the number of miles of railway in operation had increased from 1,787 miles to 7,076 miles, being an increase of nearly 396 per cent., so that the passenger traffic has increased to a much greater extent than the line of railway communication.

With respect to the revenue from passenger traffic on railways, it is remarkably curious to observe the fluctuations in the receipts from the different classes. The parliamentary trains cannot be considered to have been in proper operation prior to the years 1846–7; and since then the following very striking fluctuations in the passenger traffic of each class manifests itself:—

ABSTRACT B.

In the Year ending the	The Number of Passengers by the			
	First Class.	Second Class.	Third Class.	Parliamentary Class.
30th June, 1847....	6,572,714	18,699,288	15,865,310	6,985,493
30th June, 1852....	10,143,442	30,967,913	15,642,137	29,973,553
Increase of Traffic per annum in the above 5 years	3,570,728	12,268,625	— 223,173	22,988,060
Or, an Increase in each Class of	54·3 per cent.	65·6 per cent.	—1·4 per cent.	329·1 per cent.

It thus appears that, while there has been a pretty uniform rate of increase, in the first and second classes, of 54·3 per cent. and 65·6 per cent. respectively, there has been actually a slight decrease in the number of passengers travelling by the third class carriages; in fact, it will be seen from the figures in Table II. preceding, that ever since the year 1846, the number of passengers travelling by third class carriages has been very uniform, notwithstanding that the line of railway communication has since then increased 156 per cent., the greatest number, in any one year, being 16,990,073, in 1851, and the least being 14,378,376, in 1849; but, viewed in connection with this, will be seen the wonderful increase in the number of persons travelling by the parliamentary trains: ranging from 6,985,493, in 1847, to no less than 29,973,553, in the year 1852, being an augmentation of 329·1 per cent. This very remarkable result in the increase of passengers by the parliamentary trains will be hereafter referred to; but it is now necessary to direct attention to the receipts from each of these classes.

ABSTRACT C.

In the Year ending the	Receipts from the			
	First Class.	Second Class.	Third Class.	Parliamentary Class.
	£	£	£	£
30th June, 1847....	1,675,759	2,048,080	737,452	539,977
30th June, 1852....	2,389,971	3,010,921	662,230	1,809,163
Increase of Receipts yearly in the above 4 years	714,212	962,841	−75,222	1,269,186
Or, an Increase in each Class of	42·7 per cent.	47·0 per cent.	−10·2 per cent.	235·00 per cent.

These results follow in somewhat the same order as those deduced in Abstract B, with regard to the number of passengers; but a further abstract of the facts furnished in Table II. is calculated to throw some additional light on the increase of receipts in recent years from the parliamentary trains.

ABSTRACT D.

During the Years	Average Fare per Mile, in Pence.			
	First Class.	Second Class.	Third Class.	Parliamentary Class.
1840—43	2·506	1·809	1·261	
1844	2·349	1·699	1·145	
1845	2·212	1·588	·968	
1846	2·008	1·465	·953	·926
1847	2·046	1·414	·877	·905
1848	2·089	1·695	·953	·939
1849	2·217	1·614	·982	·952
1850	2·183	1·584	·951	·933
1851	2·103	1·531	·929	·913
1852	2·126	1·550	1·023	·905

From this abstract it will be seen that, in the first and second classes the minimum rate of fares was charged in the years 1846-7, until which period the scale of charges pretty uniformly and gradually decreased; but since then they have fluctuated at considerably higher prices, and have recently shown a very decided tendency to increase.

It may be interesting to observe in this place, the difference in the rates of fares charged in different parts of the kingdom. The form of the returns of the railway department do not admit of this being done prior to the year 1850; and the following figures embrace, therefore, only the three years 1850-2:—

Place.	Average Fare per Mile during 1850-52, in Pence.			
	First Class.	Second Class.	Third Class.	Parliamentary Class.
England and Wales	2·257	1·567	0·983	·916
Scotland	2·022	1·565	1·120	·936
Ireland	1·698	1·298	0·751	·844

These results are calculated to throw some light on this branch of railway management. In Ireland, it will be seen, the fares are for every class less than in either England or Scotland. What is also worthy of remark is, the fact that in Ireland the fares for every class of passengers have, during the above three years, been uniformly decreasing, the rates, in 1852, being about 5 per cent. less in the first, and 8 per cent. less in the parliamentary class than they were in 1850. In Scotland, on the other hand, there has, in the same period, been a decided increase of fares in every classs; while in England the fares in the second and third classes only, have increased. If the object of this paper admitted of an extension of this part of the inquiry, it would be important to trace the connexion of cheap fares and the fluctuations in the passenger traffic. The scale of fares on the Scotch lines is very peculiar. The first-class fares are intermediate between those for England and Ireland; the second class almost precisely the same as on the English lines, but quite 20 per cent. higher than those on the Irish lines; the third class fares are 14 per cent. above the English, and 49 per cent. above those of the Irish lines; and the parliamentary trains charge fares 2 per cent. above those of the English, and 11 per cent. above those of the Irish railways.

It is, however, in the parliamentary trains that the evident advantages and effects of cheap travelling are to be witnessed. Nothing can be more conclusive on this head, than the facts contained in Abstracts B and C; for if any evidence were wanted of the adaptation of the railway system to the locomotive necessities of the population of this country, it is furnished in the magical effects which the cheap and convenient parliamentary trains, stopping at every station, have had on the amount of passenger traffic since the years 1846-7, and the consequent increase of revenue to railway companies. But the introduction of parliamentary trains shows a still more wonderful result on the passenger traffic of recent years, and of a character but very imperfectly understood by even those supposed to be giving attention to railway matters. This interesting feature will be seen in the following table, in which will be found for each year—

(*a.*) The total mileage of each class of passengers, deduced from the data contained in Table II.

(*b.*) The average distance, or number of miles, travelled by passengers in each class; also

(*c.*) The average distance travelled by all classes of passengers taken collectively; and,

(*d.*) Finally, the total distance, or number of miles travelled in the aggregate by the whole of the passengers.

TABLE III.

DATE.	Total Mileage of each Class.				Average Distance Travelled by Passengers in each Class.				Average Distance by each Passenger without distinction of Class.	Total Distance Travelled (or Mileage) by all the Passengers collectively.
	First Class.	Second Class.	Third Class.	Parliamentary.	First Class.	Second Class.	Third Class.	Parliamentary.		
1840....	....	....	....	....	....	....	....	....	17·5	105,487,661
1841....	26,812,846	30,367,492	12,678,180	....	17·5	7·3	5·4	....	17·5	159,649,280
1842....	....	....	....	....	....	....	....	....	17·5	332,500,000
1843....	132,524,530	173,765,124	82,207,893	....	30·9	15·1	12·8	....	17·5	410,670,680
Total				....		....	....	....	....	1,008,307,621
1844....	145,459,821	194,327,816	101,254,638	....	29·8	15·9	11·8	....	17·2	477,533,954
1845....	119,364,014	241,528,715	161,628,843	....	21·8	16·9	12·3	....	15·9	537,280,923
1846....	198,633,227	317,479,372	185,975,614	76,129,244	32·3	18·8	12·1	19·3	18·5	810,133,204
1847....	196,667,722	347,623,197	201,811,266	143,198,320	31·4	18·6	12·7	20·5	18·7	960,285,448
Total	660,134,784	1,100,959,100	650,670,361	219,327,564	28·6	17·7	12·5	20·1	17·7	2,785,233,529
1848....	205,939,646	333,048,212	166,473,368	230,760,639	28·6	15·3	10·9	17·6	16·3	944,830,641
1849....	204,562,490	372,132,045	159,193,320	267,172,941	28·9	15·9	11·1	17·3	16·6	1,002,609,439
1850....	216,499,899	393,154,091	173,730,473	311,674,341	28·0	16·2	11·2	16·2	16·4	1,096,178,870
1851....	252,530,552	446,370,059	184,580,409	368,699,146	27·5	15·4	10·9	15·5	15·9	1,255,617,005
Total	879,533,587	1,544,704,407	683,977,570	1,178,307,067	28·2	15·7	11·0	16·4	16·3	4,259,235,955
1852....	269,799,172	466,207,123	155,361,877	479,778,033	26.6	15·1	10·0	16·0	15·8	1,370,792,153

This table shows that the average distance travelled by the passengers of each class is yearly becoming less and less. This is observable in a remarkable degree in the second, third, and the parliamentary classes; and also to some extent in the first class. The following abstract gives a succinct view of these facts :—

ABSTRACT E.

During the Years	Average Distance in Miles travelled by Passengers in the				
	First Class.	Second Class.	Third Class.	Parliamentary Class.	All Classes.
1844—47	28·6	17·7	12·5	20·1	17·7
1848—51	28·2	15·7	11·0	16·4	16·3
1852	26·6	15·1	10·0	16·0	15·8

The figures given in this abstract disclose the remarkable feature connected with the introduction of cheap fares, and which, at first sight, may appear anomalous, viz., that of passengers by the parliamentary trains, travelling greater distances than those by either the second or third class carriages. An examination, however, of the facts given in Table II, with regard to third class passengers, will help to throw some light on this result. It will be there seen that, ever since the year 1846, little or no change has taken place in the amount of the third class traffic; in fact, the obviously absurd plan in use in this country, of having four classes or grades of passengers, has had the effect of almost neutralizing the third class and substituting the parliamentary; but this is evidently not the only effect which the cheap parliamentary fares have had on the character of the passenger traffic. The upper and middle classes, for whom the first and second class modes of conveyance are more particularly designed, are so circumstanced in their travelling excursions, as to be called on to go greater distances than those to whom the lower fares are a necessity. The avocations, business arrangements, and social relations of the wealthy and the middle classes are generally such as to involve the necessity of travelling to greater distances, and hence we should naturally expect the lessening average distance of each journey as shown in Abstract E, with respect to the first, second, and third classes; but whence the amount of the increased distances travelled by the parliamentary class beyond that by either the second or third class? It will be found in the circumstance of the immense disparity between the fares of the parliamentary trains and those of the first and second class, which induces a large number of persons, going distant journies, to economise their expenses by the great saving in the prices of parliamentary trains. And this explanation will be fully understood by any one making a careful examination of the ninth column of Table II, and also the fifth column of Table III, in which it will be found, that during the year 1852 the traffic of the parliamentary class had so rapidly and so greatly increased, that

The total Mileage exceeded that of the Third Class by	324,416,156	miles.
The total Mileage exceeded that of the First Class by	209,978,861	,,
The total Mileage exceeded that of the First and Third Classes united by	54,616,984	,,
And even exceeded the total Mileage of the Second Class by	13,570,910	,,

Nothing more is needed to show the growing importance of cheap fares, and whence arises the unexpected result of the prolonged average journeys in the parliamentary classes beyond all the other classes except the first. It might almost, from an inspection of Column 5, Table II, and the last column of Abstract D, be affirmed, that even railway directors are themselves beginning to understand the importance of parliamentary trains and cheap fares; for while the fares of every other class show a very decided tendency to increase, the scale of the parliamentary class has been gradually lowering ever since the year 1849; and the legitimate consequence of this decrease in the rate of charge has been an increase of the revenue of that class, both absolutely and relatively, to the receipts from the whole passenger traffic.

ABSTRACT F.

During the Years ending	Amount of Revenue from		
	All Classes.	Parliamentary Classes.	Ratio of Receipts in Parliamentary Class to all Classes.
	£	£	
30th June, 1849	6,105,975	1,059,786	17·3 per cent.
30th June, 1852	7,984,652	1,809,163	22·7 per cent.
Increase	1,878,677	749,377	

It thus appears, that no less than 22·7 per cent. of the whole revenue from passenger traffic arises from parliamentary fares.

Apart from their financial interest and value, some of the conclusions arising directly out of the preceding tables and abstracts are of immediate importance in questions hereafter arising in this paper.

1st. The fact that, while since the year 1842, the extent of railway communication has increased 396 per cent., the number of passengers has increased at the higher ratio of 457 per cent.

2nd. Although the total mileage has increased from 332,500,000 miles to no less than 1,370,792,153 miles per annum in the same period, still the average distance travelled by each passenger, taking all classes collectively, has decreased from 17·5 miles to 15·8 miles each journey; and,

3rd. Consequently, this modification in the traffic of passengers must be attended with an increased number of arrivals and departures from the various railway stations, relatively to the whole amount of passenger traffic; a circumstance which will be found to have an important bearing on some of the results to be hereafter discussed.

Much has of late been written on the causes of railway accidents, and an endless variety of suggestions have been offered for their prevention for the future; but, almost without a single exception, the whole of what has been written, and all the remedies proposed, appear to have originated from observations on isolated, or at all events on a very partial number of cases, and nothing like a fair attempt has been made to analyse the whole of the accidents, so as to show the numerical frequency of each kind, or its tendency to occasion loss of life or limb. Some, while urging the necessity of improvement in the use and management of signals, will be found to assume that nearly all the accidents are due to causes which the suggested improvements would remove. Others again, while adopting the same view to a greater or less extent, take for granted that the bulk of all the accidents assume the form of collisions, and not contenting themselves with the simple aid of the telegraph and other station signals, bring before the public new forms of breaks and other kindred appliances calculated to stop, in a speedy manner, trains while in motion. These, and many other modes of looking at railway accidents, may, and very likely will, lead to improvements; but it still will be found that the majority of accidents would still be left untouched, and a great deal would remain to be done before anything like a considerable reduction in them is effected. By looking at so important a subject from such partial points of view, very little benefit is to be hoped for; and under this conviction, it has been believed necessary, prior to entering on the consideration of remedies, to ascertain, as correctly as possible, the true nature, extent, and causes of the various kinds of accidents.

A little reflection will suffice to show that all railway accidents may be so classified as to exhibit them—

1st. In relation to causes directly connected with the state and condition of the road and permanent way; and,

2nd. As connected with the construction and management of the rolling stock, namely, engines, carriages, trucks, &c. And this last branch of the classification is susceptible of many subdivisions; for even assuming that the permanent way, locomotive machinery, and appliances, were perfect in construction and durability, a large class of accidents will be found to take place from causes involving the considerations of skill in the management of the various details in the government of a railway and the working of trains and signals.

In the following analysis of the accidents, an attempt has been made to effect such a classification of them as would admit of showing to what extent they were due to causes beyond the control of the respective companies; and also to exhibit in what degree they were due to causes falling within the control or management of the companies.

By this mode of inquiry, results, it is hoped, will be arrived at to enable the public to judge and to distinguish to what extent the frequently occurring accidents are susceptible of diminution, either by

the exercise of greater vigilance on the part of the railway staff and the employment of greater intelligence, or by bringing into more prominent view the defects in the construction and maintenance of the permanent way and the machinery, to arrive at conclusions suggestive of improvements.

In such an analysis, considerable care is needed as to the precise form or kind of cause under which the accidents should be arranged; for it is evident that the same general form of accident might be repeated over and over again, but in a slightly modified form in regard to some of its details, thus rendering it quite possible to make many subdivisions in the general class or cause. It must, however, be obvious that subdivisions of this kind might be carried so far as to deprive the results of any practical value, unless each embraced a sufficient group of facts from which conclusions could be drawn, not only as to the characteristic results of that particular class of accidents, but also as to the permanency of the connecting circumstances usually giving birth to them: no importance could be attached to such minute subdivisions. In order to avoid the evils which would result from any attempt to deduce general principles from observations on a distinctive group of accidents of small numerical value in itself, several such groups have in many cases been combined, having one or more points of common agreement. Keeping considerations of this kind closely in view, and never losing sight of the urgent necessity, that the results to be arrived at should have a strictly practical bearing and application, the analysis made has recognized twelve principal causes or rather conditions under which accidents have taken place, six of which are assignable to circumstances over which the companies have no direct or certain control; the other six embracing causes which fall directly under the control of the companies, their officers and servants.

Having thus decided on a mode of inquiry which was deemed calculated to exhibit with sufficient precision for practical purposes the causes of the various accidents, it next appeared important to adopt a separate and distinct classification of them as they affected passengers, as they affected the public not passengers for the time being, and as they affected the officers and different servants of railway companies.

As it was also of importance to determine the variations, if any, at different periods in the frequency of railway accidents from different causes, the results will be found given for each year, for each cause, and for each class of persons.

In the following eight tables will be found a detailed record of the number of persons killed, and the number injured, in each year since 1840, from each of twelve different causes.

Table IV. has reference to passengers only.

Table V. has reference to the public not passengers, very often the friends of passengers accompanying them to the station, or meeting them on arrival.

Table VI. has reference to trespassers on the lines.

Tables VII.—XI. inclusive, relate to the employés of the companies.

TABLE IV.—*Number of Deaths and Injuries from various causes among* PASSENGERS.

CAUSE.	Reference No.	1840.		1841.		1842.		1843.		1844.		1845.		1846.		1847.		1848.		1849.		1850.		1851.		1852.		Total.	
		Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Collision	1	4	13	3	35	...	6	...	...	5	55	3	28	1	11	2	10	...	28	...	16	2	29	6	148	3	117	29	496
Off line	2	9	27	5	7	...	5	...	...	...	3	...	12	...	17	5	18	2	12	5	18	...	18	9	48	...	17	35	202
Running into station	3	1	7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...	8	...	1	4	33	5	54
Axle breaking (*d*)	4	2	10	2	...	1	3	...	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	6	15
Machinery ditto (*e*)	5	...	4	...	1	...	...	..	..	...	...	...	...	...	1	2	2	...	...	...	6	...	7	...	10	...	...	2	31
Falling from train (*c*)	6	2	2	2	3	...	2	...	1	1	1	2	...	1	...	1	1	1	2	2	...	2	2	2	2	...	...	16	16
Jumping from ditto (*b*)	7	...	5	2	8	...	8	1	5	2	4	2	3	5	9	5	7	2	3	1	3	8	1	4	4	2	4	34	64
Run over (*f*)	8	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	3	1	5	...	4	1	4	...	4	...	22	2
Collision at station	9	4	68	1	13	...	...	1	1	...	6	1	42	3	74	7	32	7	81	...	43	6	97	3	146	2	204	35	807
Mounting train in motion (*a*)	10	...	1	1	2	2	2	2	2	1	1	2	2	2	4	3	1	3	1	5	6	3	8	5	10	10	3	39	43
Crushed	11	2	5	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	1	...	...	...	5	5
Miscellaneous	12	...	...	9	14	2	...	2	...	...	...	...	...	5	3	3	22	2	2	5	4	3	10	2	4	5	2	38	61
Total	...	24	142	26	83	5	26	6	9	10	70	10	87	17	120	31	93	20	135	23	96	28	181	36	373	30	381	266	1,796

TABLE V.—*Number of Deaths and Injuries from various causes among* PUBLIC BY THEIR OWN NEGLIGENCE.

CAUSE.	Reference No.	1840.		1841.		1842.		1843.		1844.		1845.		1846.		1847.		1848.		1849.		1850.		1851.		1852.		Total.	
		Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Collision	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Off line	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Running into station	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Axle breaking	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Machinery ditto	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Falling from train	6	...	1	...	1	...	1	...	...	2	1	1	2	1	...	2	...	...	...	...	...	...	...	...	...	...	...	6	6
Jumping from ditto	7	...	...	...	...	...	...	...	...	...	1	1	...	1	...	2	...	...	...	...	...	...	...	...	...	...	...	4	1
Run over	8	4	1	7	5	8	1	10	3	12	3	5	4	12	6	15	3	6	1	9	...	16	...	16	...	13	2	133	29
Collision at station	9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mounting train in motion	10	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	2	...	3	1
Crushed	11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	1	1	...	1	...	1	1	4	2
Miscellaneous	12	...	...	...	...	...	...	...	1	1	4	1	2	1	1	1	2	2	1	1	4	4	1	6	5	8	5	25	26
Total	...	4	2	7	6	8	2	10	4	16	9	8	8	15	7	21	5	8	2	10	5	21	2	23	5	24	8	175	65

TABLE VI.—*Number of Deaths and Injuries from various causes among* TRESPASSERS.

CAUSE.	Reference No.	1840.		1841.		1842.		1843.		1844.		1845.		1846.		1847.		1848.		1849.		1850.		1851.		1852.		Total.	
		Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Collision	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	1
Off line	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Running into station	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Axle breaking	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Machinery ditto	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	...
Falling from train	6	...	2	1	...	4	3	...	1	1	2	...	...	1	...	...	1	...	...	...	...	...	1	1	...	...	...	8	10
Jumping from ditto	7	...	...	...	...	...	...	...	1	...	2	...	...	...	...	...	...	1	...	...	...	...	1	...	...	...	...	1	4
Run over	8	2	...	6	5	13	5	10	5	5	...	22	3	16	1	37	8	31	4	34	...	26	3	30	7	36	4	268	45
Collision at station	9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mounting train in motion	10	...	...	...	...	...	...	...	...	...	...	2	1	1	...	...	...	3	1	1	1	1	...	...	...	2	...	10	3
Crushed	11	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	2	...	2	...	2	...	1	1	9	1
Miscellaneous	12	...	...	...	...	...	...	2	...	...	...	...	...	...	1	...	...	...	3	...	5	2	5	5	3	...	3	9	20
Total	...	3	2	7	5	17	8	12	7	6	4	24	4	18	2	37	9	36	8	37	7	31	10	39	10	39	8	306	84

TABLE VII.—*Number of Deaths and Injuries from various causes among* ENGINE DRIVERS.

CAUSE.	Reference No.	1840.		1841.		1842.		1843.		1844.		1845.		1846.		1847.		1848.		1849.		1850.		1851.		1852.		Total.	
		Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Collision	1	...	4	...	...	...	...	...	...	2	...	...	2	1	2	1	1	1	...	1	2	...	1	...	...	...	1	6	13
Off line	2	...	...	...	...	...	...	...	...	2	1	2	1	3	2	4	3	2	5	2	...	...	2	1	2	3	5	19	21
Running into station	3	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...
Axle breaking	4	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Machinery ditto	5	...	...	...	...	...	...	1	...	...	2	...	1	...	1	...	...	1	1	...	2	2	3	2	1	1	...	7	11
Falling from train	6	...	2	1	...	1	1	1	3	1	1	...	...	2	2	...	1	...	...	...	...	...	...	3	...	1	2	10	12
Jumping from ditto	7	...	...	...	...	...	...	...	...	...	...	...	1	1	1	1	...	...	1	...	...	...	...	...	...	1	...	3	3
Run over	8	...	...	...	2	1	2	...	...	...	...	...	...	...	3	1	...	...	...	...	...	...	...	...	...	...	...	4	5
Collision at station	9	...	...	...	...	...	...	...	...	...	...	1	...	...	5	1	...	...	3	...	...	1	3	...	1	3	2	6	14
Mounting train in motion	10	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	1	...	4	1
Crushed	11	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	1	1	...	2	...	...	2	...	...	...	3	4
Miscellaneous	12	...	...	...	2	...	...	...	1	2	1	...	...	...	...	1	...	...	...	3	2	1	2	2	1	1	...	10	9
Total	...	1	6	1	4	2	4	3	4	7	6	3	5	7	14	11	6	6	11	6	8	4	11	11	5	11	10	73	94

TABLE VIII.—*Number of Deaths and Injuries from various causes among* STOKERS.

CAUSE.	Reference No.	1840.		1841.		1842.		1843.		1844.		1845.		1846.		1847.		1848.		1849.		1850.		1851.		1852.		Total.	
		Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Collision	1	...	...	...	...	1	1	...	...	...	2	1	1	...	1	1	1	...	2	1	...	1	...	1	...	2	1	8	9
Off line	2	...	...	...	...	...	...	...	...	1	1	1	1	1	2	1	4	1	3	2	...	...	1	2	1	4	3	13	16
Rnnning into station	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1
Axle breaking	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Machinery ditto	5	...	...	...	...	...	...	...	...	1	2	...	1	1	1	1	2	2	1	3	...	2	1	...	1	1	1	11	10
Falling from train	6	...	...	...	2	1	2	1	4	2	3	2	2	...	...	7	4	4	...	3	4	5	1	2	1	1	3	28	26
Jumping from ditto	7	...	...	...	...	...	1	...	...	...	...	1	...	1	...	1	...	1	1	...	...	1	...	...	1	...	1	5	4
Run over	8	1	...	...	1	2	1	...	...	...	...	1	...	...	1	2	1	2	1	...	...	2	...	...	...	1	...	11	5
Collision at station	9	...	...	...	...	...	...	...	...	...	...	...	2	...	4	2	2	...	2	1	...	1	2	...	2	1	4	5	18
Mounting train in motion	10	...	...	...	...	...	...	1	...	...	...	...	1	...	...	1	...	...	...	2	1	...	...	...	...	3	1	7	3
Crushed	11	...	5	...	...	...	...	...	...	...	2	...	...	3	1	2	1	4	3	...	...	...	2	1	3	2	2	13	17
Miscellaneous	12	...	...	...	1	...	...	...	1	2	2	1	...	1	1	4	2	...	1	1	2	4	...	...	3	2	1	15	14
Total	...	1	5	...	4	4	5	2	5	6	12	7	8	7	11	22	17	14	14	13	7	16	8	6	10	18	17	116	123

TABLE IX.—*Number of Deaths and Injuries from various causes among* GUARDS.

CAUSE.	Reference No.	1840.		1841.		1842.		1843.		1844.		1845.		1846.		1847.		1848.		1849.		1850.		1851.		1852.		Total.	
		Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Collision	1	...	...	...	...	...	...	...	...	...	1	...	1	...	...	2	1	...	3	...	...	1	...	...	...	...	2	3	8
Off line	2	...	...	...	...	...	...	...	...	...	...	...	2	...	3	1	1	2	1	...	...	...	...	...	1	3	3	6	11
Running into station	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1
Axle breaking	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	1	...	...	...	...	...	1	6
Machinery ditto	5	...	...	...	...	...	...	...	...	...	1	...	...	...	1	...	...	4	1	6	4	8	...	2	...	1	2	37	17
Falling from train	6	...	1	...	2	1	1	4	1	1	...	4	2	4	1	2	2	1	...	1	...	3	1	2	...	1	1	13	4
Jumping from ditto	7	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	2	...	1	...	...	4	2	...	...	...	4	8
Run over	8	...	...	...	1	1	...	...	...	...	...	1	...	2	...	...	1	...	1	...	...	2	2	1	...	...	...	10	3
Collision at station	9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	4	...	2	1	2	1	...	...	...	...	14	12
Mounting train in motion	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	1	4	3	1	5	...	1	2	37	30
Crushed	11	...	...	...	2	1	...	...	...	...	...	...	...	1	1	1	2	1	...	1	4	3	5	2	2	6	6	127	100
Miscellaneous	12	...	1	1	...	3	1	1	1	4	4	1	2	1	2	3	...	8	2	4	4	3	5	2	2	6	6		
Total	...	...	2	1	5	7	2	5	2	5	6	6	7	9	9	10	9	22	10	15	14	21	15	14	3	12	16		

TABLE X.—*Number of Deaths and Injuries from various causes among* PORTERS.

CAUSE.	Reference No.	1840.		1841.		1842.		1843.		1844.		1845.		1846.		1847.		1848.		1849.		1850.		1851.		1852.		Total.	
		Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Collision	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	1
Off line	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	1	1	2
Running into station	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Axle breaking	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Machinery ditto	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Falling from train	6	1	...	1	1	1	1	...	...	...	...	1	...	...	...	3	...	...	...	1	1	1	...	...	2	1	...	10	5
Jumping from ditto	7	...	...	1	...	...	...	...	...	1	...	1	...	1	...	...	...	...	...	1	...	...	1	...	...	1	1	6	2
Run over	8	...	...	1	1	1	...	...	...	...	3	1	1	1	...	5	1	3	...	6	...	4	...	3	...	6	1	31	7
Collision at station	9	...	...	...	1	...	...	...	...	...	...	1	...	1	4	...	...	...	...	...	...	...	...	1	1	1	1	4	7
Mounting train in motion..	10	...	...	...	...	...	1	2	...	...	...	...	...	...	...	1	...	3	1	...	...	...	...	1	1	2	0	9	3
Crushed	11	...	...	...	...	1	...	5	3	2	...	1	1	4	1	3	1	4	4	4	3	2	1	8	2	7	2	41	18
Miscellaneous	12	...	...	1	...	...	...	1	1	3	1	1	...	...	1	...	2	...	1	1	4	2	3	5	5	1	3	15	21
Total	...	1	...	4	3	3	2	8	4	6	4	6	2	7	7	12	4	10	6	13	8	9	5	19	11	19	9	117	65

TABLE XI.—*Number of Deaths and Injuries from various causes among* OTHER SERVANTS.

CAUSE.	Reference No.	1840.		1841.		1842.		1843.		1844.		1845.		1846.		1847.		1848.		1849.		1850.		1851.		1852.		Total.	
		Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Collision	1	...	...	...	...	...	2	...	1	...	5	1	1	1	10	...	...	1	10	1	3	1	...	1	...	5	2	11	34
Off line	2	...	...	...	1	...	...	...	...	1	1	2	9	...	2	2	4	...	...	...	...	...	...	1	...	...	...	6	17
Running into station	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Axle breaking	4	...	...	...	...	...	...	...	...	...	...	...	...	...	1	2	...	...	...	...	...	...	...	2	...	...	...	4	1
Machinery ditto	5	...	...	...	...	...	...	...	...	...	...	3	...	1	3	...	...	...	3	...	1	1	1	...	1	...	1	5	10
Falling from train	6	...	2	1	1	3	3	5	2	4	3	5	2	2	1	6	2	10	1	3	5	5	3	8	1	4	5	56	31
Jumping from ditto	7	1	1	2	2	2	1	1	...	3	1	1	1	2	3	5	4	1	3	2	1	3	1	1	2	...	1	24	21
Run over	8	9	2	19	11	17	11	11	4	16	1	19	5	42	8	38	14	45	4	41	1	39	...	25	3	32	6	353	70
Collision at station	9	...	...	...	...	...	...	...	...	1	...	...	...	...	1	...	1	5	1	...	...	...	1	2	...	6	6	8	10
Mounting train in motion..	10	...	...	...	...	1	2	...	2	...	1	3	2	6	2	4	...	6	3	6	5	3	2	3	4	3	...	35	23
Crushed	11	2	3	...	3	3	2	4	2	...	1	1	2	3	2	8	1	14	5	9	8	13	1	9	4	6	...	72	34
Miscellaneons	12	...	..	1	...	1	1	...	2	3	4	1	1	4	2	2	5	4	3	20	17	14	13	11	6	13	16	74	70
Total		12	8	23	18	27	22	21	13	28	17	36	23	61	35	67	31	86	33	82	41	79	22	63	21	63	37	648	321

The following is a condensed summary of the results of the preceding eight tables:—

ABSTRACT G.

Deaths and Injuries amongst Different Classes, from all Causes, from the 7th August, 1840, to the 31st December, 1852.

CLASS.	Killed.	Injured.	Ratio of Injured to Killed.
Passengers	266	1,796	675·20 per cent.
Public, by their own negligence	175	65	37·14 ,,
Trespassers	306	84	27·45 ,,
Engine Drivers	73	94	128·77 ,,
Stokers	116	123	106·04 ,,
Guards	127	100	78·74 ,,
Porters	117	65	55·56 ,,
Other Servants	648	321	49·54 ,,
Total	1,828	2,648	144·86 per cent.

The last column of this abstract shows in one respect a most remarkable difference in the way in which the accidents affect passengers and the servants of the companies. The number injured amongst passengers exceeds that killed by 675·20 per cent.; but amongst railway servants, the number of injuries falls short of the number of deaths, the ratio of injuries being almost exactly 65 per cent. of the deaths. The cause of this distinction will hereafter appear.

On referring to Table II. preceding, it will be found, that within the same period to which the facts of the preceding abstracts relate, the total number of passengers has amounted to 615,133,727. And, consequently, $\frac{615,133,727}{266}$ or one in every 2,312,533 passengers has been killed since the 7th of August, 1840.

And in like manner $\frac{615,133,727}{1,796}$ or one in every 342,502 passengers has sustained serious bodily injury in the same time. So that, if the causes which have hitherto prevailed in producing railway accidents should remain constant, the preceding ratios would measure the risk of life and limb in railway travelling.

The following table gives the result of Tables IV. to XI., in a more condensed form, by omitting the causes of the accidents.

TABLE XII.

Total Number of Persons Killed and Injured on Railways.

	1840.		1841.		1842.		1843.		1844.		1845.		1846.		1847.		1848.		1849.		1850.		1851.		1852.		Total.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Passengers	24	142	26	83	5	26	6	9	10	70	10	87	17	120	31	93	20	135	23	96	28	181	36	373	30	381	266	1,796
Public by their own Negligence	4	2	7	6	8	2	10	4	16	9	8	8	15	7	21	5	8	2	10	5	21	2	23	5	24	8	175	65
Trespassers	3	2	7	5	17	8	12	7	6	4	24	4	18	2	37	9	36	8	37	7	31	10	39	10	39	8	306	84
Engine Drivers...	1	6	1	4	2	4	3	4	7	6	3	5	7	14	11	6	6	11	6	8	4	11	11	5	11	10	73	94
Stokers	1	5	....	4	4	5	2	5	6	12	7	8	7	11	22	17	14	14	13	7	16	8	6	10	18	17	116	123
Guards	....	2	1	5	7	2	5	2	5	6	6	7	9	9	10	9	22	10	15	14	21	15	14	3	12	16	127	100
Porters	1	....	4	3	3	2	8	4	6	4	6	2	7	7	12	4	10	6	13	8	9	5	19	11	19	9	117	65
Other Servants....	12	8	23	18	27	22	21	13	28	17	36	23	61	35	67	31	86	33	82	41	79	22	63	21	63	37	648	321
Total	46	167	69	128	73	71	67	48	84	128	100	144	141	205	211	174	202	219	199	186	209	254	211	438	216	486	1,828	2,648

The following condensed summary of this table, in so far as passengers are affected, shows, in a very satisfactory way, the gradual diminution of railway accidents.

ABSTRACT H.

PERIOD.	Passengers.			Ratios.	
	Number.	Killed.	Injured.	One killed in	One injured in
1840–43.....	57,617,578	61	260	944,550	221,606
1844–47.....	156,698,002	68	370	2,304,382	423,508
1848–51.....	264,173,027	107	785	2,468,907	336,526
1852	86,758,997	30	381	2,891,966	227,714

It thus appears that, while in the years 1840–43, there was 1 killed in every 944,550 passengers, there was, in the years 1848–51, only 1 in every 2,468,907 passengers, being not one death for two which happened in the earlier period.

So also will a reduction be found to have taken place in the ratio of passengers injured.

In like manner will Table XII. furnish the means by which to determine the relative number of railway servants killed and injured in the same periods; but it is proposed, in the first place, to keep to that part of the inquiry which affects the passengers only. This, although really the least important branch of the subject, so far as loss of life is concerned, is, notwithstanding, that in which the general public is most interested; and, as the daily and periodical press have recently taken up the matter so warmly, as complete an analysis of it will be given in this paper as the available facts and data will admit of being accomplished; and, in order to carry out this view, the whole of the materials have been re-arranged in the following eight tables, from which a very distinct and complete knowledge of the intensity of each cause in producing accidents among all the classes of persons observed upon, in each year, and throughout the whole period, may be obtained.

It will be seen from Tables XIV. and XV., that the number of deaths from railway accidents among the public, not being either passengers or employés, is much greater than amongst passengers merely.

The number of passengers killed, according to Table XIII., is 266.

The number killed of the public (neither passengers nor employés), by their own negligence, and of trespassers, is 481.

But the consideration of the last group of deaths will be likewise reserved for discussion in the latter part of this communication.

TABLE XIII.

Number of Deaths and Injuries from various causes among

PASSENGERS.

Years.	Collision.		Off Line.		Running into Station.		(d) Axle Breaking.		(e) Machinery Breaking.		(c) Falling from Train.		(b) Jumping from Train.		(f) Run Over.		Collision at Station.		(a) Mounting Train in Motion.		Crushed.		Miscellaneous.		Years.	Total.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.		Killed.	Injured.
1840..	4	13	9	27	1	7	2	10	..	4	2	2	..	5	..	..	4	68	..	1	2	5	..	..	1840..	24	142
1841..	3	35	5	7	..	..	2	..	..	1	2	3	2	8	1	..	1	13	1	2	..	..	9	14	1841..	26	83
1842..	..	6	..	5	..	..	1	3	..	..	..	2	..	8	..	..	..	..	2	2	..	..	2	..	1842..	5	26
1843..	..	..	..	..	..	..	..	..	..	..	..	1	1	5	..	..	1	1	2	2	..	..	2	..	1843..	6	9
	7	54	14	39	1	7	5	13	..	5	4	8	3	26	1	..	6	82	5	7	2	5	13	14		61	260
1844..	5	55	..	3	..	..	1	..	..	..	1	1	2	4	..	..	..	6	1	1	..	..	..	..	1844..	10	70
1845..	3	28	..	12	..	..	..	..	..	..	2	..	2	3	..	..	1	42	2	2	..	..	..	..	1845..	10	87
1846..	1	11	..	17	..	..	..	1	..	1	1	..	5	9	..	..	3	74	2	4	..	..	5	3	1846..	17	120
1847..	2	10	5	18	..	..	..	..	2	2	1	1	5	7	1	..	7	32	3	1	2	..	3	22	1847..	31	93
	11	104	5	50	..	..	1	1	2	3	5	2	14	23	1	..	11	154	8	8	2	..	8	25		68	370
1848..	..	28	2	12	..	5	..	..	..	..	1	2	2	3	3	1	7	81	3	1	..	..	2	2	1848..	20	135
1849..	..	16	5	18	..	..	..	..	..	6	2	..	1	3	5	..	..	43	5	6	..	..	5	4	1849..	23	96
1850..	2	29	..	18	..	8	..	..	..	7	2	2	8	1	4	1	6	97	3	8	..	..	3	10	1850..	28	181
1851..	6	148	9	48	..	1	..	..	..	10	2	2	4	4	4	..	3	146	5	10	1	..	2	4	1851..	36	373
	8	221	16	96	..	14	..	..	..	23	7	6	15	11	16	2	16	367	16	25	1	..	12	20		107	785
1852..	3	117	..	17	4	33	..	1	..	..	..	..	2	4	4	..	2	204	10	3	..	..	5	2	1852..	30	381
Totals	29	496	35	202	5	54	6	15	2	31	16	16	34	64	22	2	35	807	39	43	5	5	38	61	Grand Total	266	1,796

TABLE XIV.

Number of Deaths and Injuries from various causes among

PUBLIC BY THEIR OWN NEGLIGENCE.

Years.	Collision.		Off Line.		Running into Station.		Axle Breaking.		Machinery Breaking.		Falling from Train.		Jumping from Train.		Run Over.		Collision at Station.		Mounting Train in Motion.		Crushed.		Miscellaneous.		Years.	Total.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.		Killed.	Injured.
1840..	..	..	..	..	..	..	..	..	..	..	.	1	..	..	4	1	..	..	..	..	..	..	..	..	1840..	4	2
1841..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	7	5	..	..	..	..	..	..	..	..	1841..	7	6
1842..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	8	1	..	..	..	..	..	..	..	..	1842..	8	2
1843..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10	3	..	..	..	..	..	..	..	1	1843..	10	4
	..	..	..	..	..	..	..	..	..	..	..	3	..	..	29	10	..	..	..	..	..	..	..	1		29	14
1844..	..	..	..	..	..	..	..	..	..	..	2	1	..	1	12	3	..	..	1	..	..	..	1	4	1844..	16	9
1845..	..	..	..	..	..	..	..	..	..	..	1	2	1	..	5	4	..	..	..	..	..	..	1	2	1845..	8	8
1846..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	12	6	..	..	..	..	..	..	1	1	1846..	15	7
1847..	..	..	..	..	..	..	..	..	..	..	2	..	2	..	15	3	..	..	..	..	1	..	1	2	1847..	21	5
	..	..	..	..	..	..	..	..	..	..	6	3	4	1	44	16	..	..	1	..	1	..	4	9		60	29
1848..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	1	..	..	..	..	..	..	2	1	1848..	8	2
1849..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	9	..	..	..	..	..	..	1	1	4	1849..	10	5
1850..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	16	..	..	..	..	1	1	..	4	1	1850..	21	2
1851..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	16	..	..	..	..	..	1	..	6	5	1851..	23	5
	..	..	..	..	..	..	..	..	..	..	..	..	..	..	47	1	..	..	..	1	2	1	13	11		62	14
1852..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	13	2	..	..	2	..	1	1	8	5	1852..	24	8
Totals	..	..	..	..	..	..	..	..	..	..	6	6	4	1	133	29	..	..	3	1	4	2	25	26	Grand Total	175	65

TABLE XV.

Number of Deaths and Injuries from various causes among

TRESPASSERS.

Years.	Collision.		Off Line.		Running into Station.		Axle Breaking.		Machinery Breaking.		Falling from Train.		Jumping from Train.		Run Over.		Collision at Station.		Mounting in Train Motion.		Crushed.		Miscellaneous.		Years.	Total.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.		Killed.	Injured.
1840..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	2	..	..	..	..	..	1	..	..	..	1840..	3	2
1841..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	6	5	..	..	..	..	..	..	..	..	1841..	7	5
1842..	..	..	..	..	..	..	..	..	..	..	4	3	..	..	13	5	..	..	..	..	..	..	..	..	1842..	17	8
1843..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	10	5	..	..	..	..	..	..	2	..	1843..	12	7
	..	..	..	..	..	..	..	..	..	..	5	6	..	1	31	15	..	..	..	..	1	..	2	..		39	22
1844..	..	..	..	..	..	..	..	..	..	..	1	2	..	2	5	..	..	..	..	..	..	..	..	..	1844..	6	4
1845..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	22	3	..	..	2	1	..	..	..	..	1845..	24	4
1846..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	16	1	..	..	1	..	..	..	..	1	1846..	18	2
1847..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	37	8	..	..	..	..	..	..	..	..	1847..	37	9
	..	..	..	..	..	..	..	..	..	..	2	3	..	2	80	12	..	..	3	1	..	..	..	1		85	19
1848..	..	..	..	..	..	..	..	..	..	..	.	..	1	..	31	4	..	..	3	1	1	..	..	3	1848..	36	8
1849..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	34	..	..	..	1	1	2	..	..	5	1849..	37	7
1850..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	26	3	..	..	1	..	2	..	2	5	1850..	31	10
1851..	..	..	..	..	..	..	..	..	1	..	1	..	..	..	30	7	..	..	..	..	2	..	5	3	1851..	39	10
	..	1	..	..	..	..	..	..	1	..	1	1	1	1	121	14	..	..	5	2	7	..	7	16		143	35
1852..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	36	4	..	..	2	..	1	1	..	3	1852..	39	8
Totals	..	1	..	..	..	..	..	..	1	..	8	10	1	4	268	45	..	..	10	3	9	1	9	20	Grand Total	306	84

TABLE XVI.

Number of Deaths and Injuries from various causes among

ENGINE DRIVERS.

Years.	Collision.		Off Line.		Running into Station.		Axle Breaking.		Machinery Breaking.		Falling from Train.		Jumping from Train.		Run Over.		Collision at Station.		Mounting Train in Motion.		Crushed.		Miscellaneous.		Years.	Total.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.		Killed.	Injured.
1840..	..	4	..	..	1	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	1840..	1	6
1841..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	2	..	..	..	..	..	..	..	2	1841..	1	4
1842..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	1	2	..	..	..	1	..	..	..	..	1842..	2	4
1843..	..	..	..	..	..	..	..	..	1	..	1	3	..	..	..	..	..	..	1	..	..	..	..	1	1843..	3	4
	..	4	..	..	1	..	..	..	1	..	3	6	..	..	1	4	..	..	1	1	..	..	..	3		7	18
1844..	2	..	2	1	..	..	..	..	..	2	1	1	..	..	..	..	..	..	..	..	..	1	2	1	1844..	7	6
1845..	..	2	2	1	..	..	..	..	..	1	..	..	..	1	..	..	1	..	..	..	..	..	..	..	1845..	3	5
1846..	1	2	3	2	..	..	..	1	..	1	2	2	1	1	..	..	..	5	..	..	..	..	..	..	1846..	7	14
1847..	1	1	4	3	..	..	..	..	..	..	..	1	1	..	3	1	1	..	..	..	..	..	1	..	1847..	11	6
	4	5	11	7	..	..	..	1	..	4	3	4	2	2	3	1	2	5	..	..	..	1	3	1		28	31
1848..	1	..	2	5	..	..	..	..	1	1	..	..	..	1	..	..	..	3	1	..	1	1	..	..	1848..	6	11
1849..	1	2	2	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	2	3	2	1849..	6	8
1850..	..	1	..	2	..	..	..	..	2	3	..	..	..	..	..	..	1	3	..	..	..	..	1	2	1850..	4	11
1851..	..	..	1	2	..	..	..	..	2	1	3	..	..	..	..	..	..	1	1	..	2	..	2	1	1851..	11	5
	2	3	5	9	..	..	..	..	5	7	3	..	..	1	..	..	1	7	2	..	3	3	6	5		27	35
1852..	..	1	3	5	..	..	..	..	1	..	1	2	1	..	..	..	3	2	1	..	..	..	1	..	1852..	11	10
Totals	6	13	19	21	1	..	..	1	7	11	10	12	3	3	4	5	6	14	4	1	3	4	10	9	Grand Total	73	94

TABLE XVII.

Number of Deaths and Injuries from various causes among

STOKERS.

Years.	Collision.		Off Line.		Running into Station.		Axle Breaking.		Machinery Breaking.		Falling from Train.		Jumping from Train.		Run Over.		Collision at Station.		Mounting Train in Motion.		Crushed.		Miscellaneous.		Years.	Total.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.		Killed.	Injured.
1840..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	5	..	..	1840..	1	5
1841..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	1	..	..	..	..	..	..	..	1	1841..	..	4
1842..	1	1	..	..	..	..	..	..	..	..	1	2	..	1	2	1	..	..	..	..	..	..	..	..	1842..	4	5
1843..	..	..	..	..	..	..	..	..	..	..	1	4	..	..	..	..	..	..	1	..	..	..	..	1	1843..	2	5
	1	1	..	..	..	..	..	..	..	..	2	8	..	1	3	2	..	..	1	..	..	5	..	2		7	19
1844..	..	2	1	1	..	..	..	..	1	2	2	3	..	..	..	..	..	..	..	..	..	2	2	2	1844..	6	12
1845..	1	1	1	1	..	..	..	..	..	1	2	2	1	..	1	..	..	2	..	1	..	..	1	..	1845..	7	8
1846..	..	1	1	2	..	..	..	..	1	1	..	..	1	..	..	1	..	4	..	..	3	1	1	1	1846..	7	11
1847..	1	1	1	4	..	..	..	..	1	2	7	4	1	..	2	1	2	2	1	..	2	1	4	2	1847..	22	17
	2	5	4	8	..	..	..	..	3	6	11	9	3	..	3	2	2	8	1	1	5	4	8	5		42	48
1848..	..	2	1	3	..	..	..	..	2	1	4	..	1	1	2	1	..	2	..	..	4	3	..	1	1848..	14	14
1849..	1	..	2	..	..	..	..	..	3	..	3	4	..	..	..	..	1	..	2	1	..	..	1	2	1849..	13	7
1850..	1	..	..	1	..	1	..	..	2	1	5	1	1	..	2	..	1	2	..	..	..	2	4	..	1850..	16	8
1851..	1	..	2	1	..	..	..	..	..	1	2	1	..	1	..	..	..	2	..	..	1	1	..	3	1851..	6	10
	3	2	5	5	..	1	..	..	7	3	14	6	2	2	4	1	2	6	2	1	5	6	5	6		49	39
1852..	2	1	4	3	..	..	..	..	1	1	1	3	..	1	1	..	1	4	3	1	3	2	2	1	1852..	18	17
Totals	8	9	13	16	..	1	..	..	11	10	28	26	5	4	11	5	5	18	7	3	13	17	15	14	Grand Total	116	123

TABLE XVIII.

Number of Deaths and Injuries from various causes among GUARDS.

Years.	Collision.		Off Line.		Running into Station.		Axle Breaking.		Machinery Breaking.		Falling from Train.		Jumping from Train.		Run Over.		Collision at Station.		Mounting Train in Motion.		Crushed.		Miscellaneous.		Years.	Total.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.		Killed.	Injured.
1840..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1	1840..	..	2
1841..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	1	..	..	..	..	..	2	1	..	1841..	1	5
1842..	..	..	..	..	..	..	..	..	..	..	1	1	1	..	1	..	..	..	..	..	1	..	3	1	1842..	7	2
1843..	..	..	..	..	..	..	..	..	..	..	4	1	..	..	..	..	..	..	..	..	..	..	1	1	1843..	5	2
	..	..	..	..	..	..	..	..	..	..	5	5	1	..	1	1	..	..	..	..	1	2	5	3		13	11
1844..	..	1	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	4	4	1844..	5	6
1845..	..	1	..	2	..	..	..	..	..	..	4	2	..	..	1	..	..	..	..	..	..	..	1	2	1845..	6	7
1846..	..	..	..	3	..	..	..	..	..	1	4	1	..	..	2	..	1	1	..	..	1	1	1	2	1846..	9	9
1847..	2	1	1	1	..	..	..	..	..	..	2	2	..	..	..	1	..	2	1	..	1	2	3	..	1847..	10	9
	2	3	1	6	..	..	..	..	..	2	11	5	..	..	3	1	1	3	1	..	2	3	9	8		30	31
1848..	..	3	2	1	..	..	..	..	..	2	4	1	1	..	2	..	..	1	4	..	1	..	8	2	1848..	22	10
1849..	..	..	..	..	..	..	..	..	..	1	6	4	..	..	1	..	1	..	2	1	1	4	4	4	1849..	15	14
1850..	1	..	.	..	..	1	..	..	1	1	8	..	..	..	3	1	..	4	2	2	3	1	3	5	1850..	21	15
1851..	..	..	..	1	..	..	..	..	..	..	2	..	..	..	2	..	2	..	1	..	5	..	2	2	1851..	14	3
	1	3	2	2	..	1	..	..	1	4	20	5	1	..	8	1	3	5	9	3	10	5	17	13		72	42
1852..	..	2	3	3	..	..	..	..	..	..	1	2	..	..	1	1	..	..	..	..	1	2	6	6	1852..	12	16
Totals	3	8	6	11	..	1	..	..	1	6	37	17	2	..	13	4	4	8	10	3	14	12	37	30	Grand Total	127	100

TABLE XIX.

Number of Deaths and Injuries from various causes among

PORTERS.

Years.	Collision.		Off Line.		Running into Station.		Axle Breaking.		Machinery Breaking.		Falling from Train.		Jumping from Train.		Run Over.		Collision at Station.		Mounting Train in Motion.		Crushed.		Miscellaneous.		Years.	Total.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.		Killed.	Injured.
1840..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1840..	1	..
1841..	..	..	..	..	..	..	..	..	..	..	1	1	1	..	1	1	..	1	..	..	..	..	1	..	1841..	4	3
1842..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	1	..	..	..	..	1	1	..	..	..	1842..	3	2
1843..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	5	3	1	1	1843..	8	4
	..	..	..	..	..	..	..	..	..	..	3	2	1	..	2	1	..	1	2	1	6	3	2	1		16	9
1844..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	3	..	..	..	..	2	..	3	1	1844..	6	4
1845..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	1	1	1	..	..	..	1	1	1	..	1845..	6	2
1846..	..	..	..	1	..	..	..	..	..	..	..	..	1	..	1	..	1	4	..	..	4	1	..	1	1846..	7	7
1847..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	5	1	..	..	1	..	3	1	..	2	1847..	12	4
	..	..	..	1	..	..	..	..	..	..	4	..	3	..	7	5	2	4	1	..	10	3	4	4		31	17
1848..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	3	1	4	4	..	1	1848..	10	6
1849..	..	..	..	..	..	..	..	..	..	..	1	1	1	..	6	..	..	..	..	..	4	3	1	4	1849..	13	8
1850..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	4	..	..	..	..	..	2	1	2	3	1850..	9	5
1851..	..	..	1	..	..	..	..	..	..	..	..	2	..	..	3	..	1	1	1	1	8	2	5	5	1851..	19	11
	..	..	1	..	..	..	..	..	..	..	2	3	1	1	16	..	1	1	4	2	18	10	8	13		51	30
1852..	..	..	..	1	...	..	..	..	..	..	1	..	1	1	6	1	1	1	2	..	7	2	1	3	1852..	19	9
Totals	..	..	1	2	..	..	..	..	..	..	10	5	6	2	31	7	4	7	9	3	41	18	15	21	Grand Total	117	65

TABLE XX.

Number of Deaths and Injuries from various causes among

OTHER SERVANTS.

Years.	Collision.		Off Line.		Running into Station.		Axle Breaking.		Machinery Breaking.		Falling from Train.		Jumping from Train.		Run Over.		Collision at Station.		Mounting Train in Motion.		Crushed.		Miscellaneous.		Years.	Total.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.		Killed.	Injured.
1840..	..	..	..	..	..	..	..	..	..	..	..	2	1	1	9	2	..	..	..	..	2	3	..	..	1840..	12	8
1841..	..	..	..	1	..	..	..	..	..	..	1	1	2	2	19	11	..	..	..	..	..	3	1	..	1841..	23	18
1842..	..	2	..	..	..	..	..	..	..	..	3	3	2	1	17	11	..	..	1	2	3	2	1	1	1842..	27	22
1843..	..	1	..	..	..	..	..	..	..	..	5	2	1	..	11	4	..	..	..	2	4	2	..	2	1843..	21	13
	..	3	..	1	..	..	..	..	..	..	9	8	6	4	56	28	..	..	1	4	9	10	2	3		83	61
1844..	..	5	1	1	..	..	.	..	..	..	4	3	3	1	16	1	1	..	..	1	..	1	3	4	1844..	28	17
1845..	1	1	2	9	..	..	..	..	3	..	5	2	1	1	19	5	..	..	3	2	1	2	1	1	1845..	36	23
1846..	1	10	..	2	..	..	..	1	1	3	2	1	2	3	42	8	..	1	6	2	3	2	4	2	1846..	61	35
1847..	..	..	2	4	..	..	2	..	..	..	6	2	5	4	38	14	..	1	4	..	8	1	2	5	1847..	67	31
	2	16	5	16	..	..	2	1	4	3	17	8	11	9	115	28	1	2	13	5	12	6	10	12		192	106
1848..	1	10	..	..	..	..	..	..	..	3	10	1	1	3	45	4	5	1	6	3	14	5	4	3	1848..	86	33
1849..	1	3	..	..	..	..	..	..	..	1	3	5	2	1	41	1	..	..	6	5	9	8	20	17	1849..	82	41
1850..	1	..	..	..	..	..	..	..	1	1	5	3	3	1	39	..	..	1	3	2	13	1	14	13	1850..	79	22
1851..	1	..	1	..	..	..	2	..	..	1	8	1	1	2	25	3	2	..	3	4	9	4	11	6	1851..	63	21
	4	13	1	..	..	..	2	..	1	6	26	10	7	7	150	8	7	2	18	14	45	18	49	39		310	117
1852..	5	2	..	..	..	..	..	..	..	1	4	5	..	1	32	6	..	6	3	..	6	..	13	16	1852..	63	37
Totals	11	34	6	17	..	..	4	1	5	10	56	31	24	21	353	70	8	10	35	23	72	34	74	70	Grand Total	648	321

The preceding eight tables have been given in the present very complete form, so as to admit of other inquirers who may happen to take a different view of the manner in which the subject should be treated, to make new combinations for themselves. The following Table, XXI., on next page, shows, for three different periods of years, the ratio of the mortality per cent. from each cause to the mortality from all causes; and, so far as passengers are concerned, some of the results are rather curious.

It will be seen from the first section of this table, that the deaths of passengers from collisions, and from trains running off the line, which constitute a large portion of the whole, have been gradually diminishing, while deaths from passengers falling from the trains have scarcely varied. Again, the deaths from axles breaking, in the four years 1840-3, formed 8 per cent. of the whole deaths in that period; but, since the year 1844, not a single death of a passenger has taken place assignable to that cause. And in regard to deaths from the breaking of other parts of the machinery none have happened since 1847.

In the latter part of 1840, one death of a passenger was occasioned by the running of a train into the station; but no other since that time, although 21 have been injured from the same cause at different periods. The deaths of passengers from collisions at stations increased subsequent to 1843, and have since remained nearly uniform at about 15 per cent. of the deaths from all causes.

The deaths occasioned by passengers jumping from trains while in motion have increased in a very remarkable manner ever since 1840, as well as the deaths from passengers mounting trains while in motion.

Results of the kind now enumerated, although given in strict accordance with the methods of many statistical inquirers, are, if given in such form only, liable to a serious objection, for in every case where the intensity of a variety of causes is being measured, the pressure of any one or more of the causes might actually be remaining constant, while the form of the preceding table is capable of making them appear as increasing or decreasing in intensity, and *vice versâ*, the intensity of the same causes might in reality be undergoing great modifications, and at the same time appear uniform in the table. An attentive consideration of the principle on which the table is constructed will show this to be the case; and the actual facts contained in it furnish an excellent illustration of these remarks. It will be seen that, in the period 1848–51, no deaths have taken place among passengers from the causes placed third, fourth, and fifth in order; and the immediate effect of the exclusion of deaths from these causes is to give an apparent augmentation of intensity to the remaining causes in operation in that period; a similar effect would also be produced, although not in degree the same, by any fluctuations whatever in the intensity of one or more of the causes. The proper use of such a table as that now under consideration, is to direct attention to the fact of disturbing causes being in operation, but not to measure the degree or exact extent of the intensity of each cause, which must be determined by a different method.

It is not easy, in a short paper, to follow a course of argument keeping clearly in view the many fluctuations in the ratios of deaths among a great variety of causes; but it is obvious, that a number of

TABLE XXI.

Ratio of Mortality Per Cent. from each cause, to the Mortality from all causes, among each Class of Persons.

CAUSE.	Passengers.			Public by their own Negligence.			Trespassers.			Engine Drivers.		
	1840—43.	1844—47.	1848—51.	1840—43.	1844—47.	1848—51.	1840—43.	1844—47.	1848—51.	1840—43.	1844—47.	1848—51.
Collision	11·48	16·18	7·48	....	....	....	....	....	....	....	14·29	7·41
Off line	22·95	7·35	14·95	....	....	....	....	....	....	....	39·29	18·52
Running into station	1·64	....	....	....	....	....	....	....	....	14·28	....	....
Axle breaking	8·19	1·47	....	....	....	....	....	....	....	....	....	....
Machinery ditto	....	2·94	....	....	....	....	....	....	·70	14·29	....	18·52
Falling from train	6·56	7·35	6·54	....	10·00	....	12·82	2·35	·70	42·86	10·71	11·11
Jumping from ditto	4·92	20·60	14·02	....	6·67	....	....	....	·70	....	7·14	....
Run over	1·64	1·47	14·95	100·00	73·33	75·81	79·49	94·12	84·61	14·28	10·71	....
Collision at station	9·84	16·18	14·95	....	....	....	....	....	....	....	7·15	3·70
Mounting train in motion	8·19	11·76	14·95	....	1·67	....	....	3·53	3·49	14·29	....	7·41
Crushed	3·28	2·94	·94	....	1·67	3·22	2·56	....	4·90	....	....	11·11
Miscellaneous	21·31	11·76	11·22	....	6·66	20·97	5·13	....	4·90	....	10·71	22·22

CAUSE.	Stokers.			Guards.			Porters.			Other Servants.		
	1840—43.	1844—47.	1848—51.	1840—43.	1844—47.	1848—51.	1840—43.	1844—47.	1848—51.	1840—43.	1844—47.	1848—51.
Collision	14·29	4·76	6·12	....	6·67	1·39	....	....	....	....	1·04	1·29
Off line	....	9·52	10·21	....	3·33	2·78	....	....	1·96	....	2·60	·32
Running into station	....	....	....	....	....	....	....	....	....	....	....	....
Axle breaking	....	....	....	....	....	....	....	....	....	....	1·04	·64
Machinery ditto	....	7·14	14·28	....	....	1·39	....	....	....	....	2·08	·32
Falling from train	28·57	26·20	28·57	38·46	36·67	27·77	18·75	12·90	3·92	10·84	8·86	8·39
Jumping from ditto	....	7·14	4·08	7·69	....	1·39	6·25	9·68	1·96	7·23	5·73	2·26
Run over	42·85	7·14	8·16	7·69	10·00	11·11	12·50	22·58	31·37	67·47	59·90	48·39
Collision at station	....	4·76	4·08	....	3·33	4·17	....	6·45	1·96	....	·52	2·26
Mounting train in motion	14·29	2·38	4·08	....	3·33	12·50	12·50	3·23	7·84	1·21	6·77	5·81
Crushed	....	11·91	10·21	7·70	6·67	13·89	37·50	32·26	35·30	10·84	6·25	14·51
Miscellaneous	....	19·05	10·21	38·46	30·00	23·61	12·50	12·90	15·69	2·41	5·21	15·81

the circumstances, under which railway accidents have taken place, are for many purposes susceptible of the very simple classification already more than once alluded to.

A large number of the deaths are assignable to causes over which it is evident the directors and managers have little, if any, control, such as—

(*a.*) Passengers mounting trains while in motion.
(*b.*) Passengers jumping from trains while in motion.
(*c.*) Passengers falling from trains while in motion.
(*d.*) Axles breaking.
(*e.*) Machinery breaking.
(*f.*) Passengers being run over.

And if all the remaining causes in the preceding tables were placed to the credit of the management of railways, and held as coming in some measure under the control of the railway officers and servants of the companies, little exception can be taken to the classification on the ground that it is calculated to underrate their responsibilities.

The following abstract will show the results thus arrived at:—

ABSTRACT I.

CAUSES.	Number of Passengers.	
	Killed.	Injured.
(A) Beyond control of the Companies	119	171
(B) Under control of the Companies (including miscellaneous group)	147	1,625
Ratio per cent. of (A) to the whole	44·7	9·5
Ratio per cent. of (B) to the whole	55·3	90·5

It will thus be seen, that about 44·7 per cent. of all the deaths has taken place from causes over nearly all of which the passengers themselves have control, the exception being the eight deaths included in causes (*d*) and (*e*), and for which the companies can scarcely be in any way held responsible. But in regard to the injuries, 9·5 per cent. only of the accidents are so circumstanced, which calls attention to a very remarkable feature in the results now under consideration.

(*a.*) The deaths from causes beyond the control of the companies form 69·6 per cent. of the number of injuries from the same causes.

(*b.*) The deaths from causes under the control of the companies are 9 per cent. of the number of injuries from the same causes; and

Hence the tendency of accidents, which may be considered to arise from details of management, is to inflict bodily injury rather than to occasion death; for in respect to every 100 injuries, 9 deaths take place from corresponding causes, while among the accidents due to causes within the influence of the passengers themselves, for every 100 injuries nearly 70 deaths occur.

This method of stating the results naturally leads to the inquiry, Do the accidents, falling within the class of causes assumed to come under the control of the companies, increase or diminish?

The classification in Abstract I., it will be seen, includes the deaths of the miscellaneous groups in Tables IV. to XI. inclusive, and also Tables XIII. to XX. inclusive, as coming under the control of the companies; but it must be obvious, that some of these accidents will be due to causes over which the companies cannot be supposed to have any control whatever. The more correct comparison will therefore evidently be that between ascertained causes only; and the following abstract is so corrected:—

ABSTRACT J.

CAUSES.	Deaths of Passengers during					
	1840–43.		1844–47.		1848–51.	
	Number.	Per-Centage of Total.	Number.	Per-Centage of Total.	Number.	Per-Centage of Total.
Beyond control of Companies	18	37·50	31	51·67	54	56·84
Under control of Companies....	30	62·50	29	48·33	41	43·16

It will thus be seen, that the deaths from causes under the control of the companies have, in reference to the total deaths from all causes, been gradually diminishing ever since 1840.

In the period 1840–43, 1844–47, 1848–51 the deaths from all causes under control of the Companies = 62·50 per cent. of all the deaths; = 48·33 ,, ; = 43·16 ,,

So that it is evident, that the class of accidents under the control of the several companies is decreasing in relation to the total accidents in a most satisfactory and very rapid manner.

In order to avoid the objections which might be urged against the preceding mode of comparison, and prominently referred to in speaking of Table XXI. preceding, the following arrangement of the facts is referred to, which is faultless as a test, but establishes the same conclusion arrived at from a consideration of Abstract J.

ABSTRACT K.

CAUSES.	Period of Observation.		
	1840–43.	1844–47.	1848–51.
Number of passengers	57,617,578	156,698,002	264,173,027
Deaths from causes beyond control of Companies	18	31	54
Deaths from causes under control of Companies	30	29	41
Ratio of deaths beyond control of Companies	One in 3,200,977	One in 5,054,774	One in 4,892,093
Ratio of deaths under control of Companies	1,920,585	5,403,379	6,443,244

There is here evidence, not only of a great diminution of all kinds of accidents to passengers, but, what is exceedingly satisfactory, of those accidents which are due to causes assumed to be under the control of the companies, in a very remarkable degree compared with the remaining class of accidents.

For while deaths from causes beyond the control of the companies have, between the periods 1840–43 and 1848–51, diminished in the ratio of 49 to 30, those from causes under the control of the companies have diminished in the ratio of 64 to 19. This result is certainly one not generally understood by the public, for not only are all railway accidents supposed to be very much on the increase, but, those due to details of management, are believed to be rapidly and alarmingly so. The facts of the case do not support this view, for they disclose the truth, that railway management, so far as accidents producing deaths among passengers are concerned, has greatly improved, and apparently in a steady and high ratio.

In the period 1840–43	the deaths from	= One in	1,920,585	Passengers.
„ 1844–47	causes under the control	= „	5,403,379	„
„ 1848–51	of the Companies	= „	6,443,244	„

So that this class of accidents has since diminished to about 30 per cent. of its frequency and magnitude in the year 1843.

These results, viewed in connection with those of Abstract H, give birth to some interesting considerations. If regard be had to the causes of railway accidents, so far as they can be controlled by the companies, it is obvious that the increasing extent and complicated system of the railway communication, as it now exists in its ramified arteries over the country, together with the modifications in passenger traffic of recent years, enumerated in Clauses 1st, 2nd, and 3rd, of page 297, would, unless greatly improved management were keeping pace with the growing extent of railway traffic, lead to an immense increase in the number of accidents, not only absolutely, but relatively to the amount of that traffic.

If, therefore, the results of Abstracts H and K be borne in mind, which shows that the loss of life among passengers, from all causes, has decreased in recent years, and while it is, at the same time, evident that the class of deaths which has taken place, from causes under the control of the companies, has, in relation to the whole of these reduced deaths, been subject, year after year, to a greatly increased rate of reduction, as shown in Abstract K, every one must, notwithstanding the present popular outcry, be satisfied that means and influences are actively at work which are daily increasing the safety of life in railway travelling. Whether this change be due to the better general regulations enforced by the directors of the companies, or to the improved skill and intelligence of their officers and servants, still the results of this inquiry afford the most striking testimony, from the recent improvements and increased safety in railway travelling, that the same means will be persevered in to effect a still further reduction in the frequency and intensity of railway accidents.

An inspection of Tables XIII. and XXI. will show the relative number of deaths arising from each cause; and, in regard to those

accidents supposed to be under the control of the companies, the most important are those under the head of collisions and running off the line. It has been said of late, that the great bulk of all the railway accidents is due to collisions; but an inspection of Table XXI. will show that—

Collisions at stations constitute 15·0 per cent. of the whole deaths among passengers
Other collisions, not at stations, 7·5 ,, ,,

In all ..... 22·5 per cent. of all the deaths among passengers.

When, however, we arrive at that point of this inquiry in which the rate of deaths of all classes of persons, including employés, is considered, it will be found, that of a total of 1,828 deaths, not more than 119, or not one-fifteenth, has been occasioned by collisions of all sorts. Collisions do not, therefore, appear to affect railway servants so much as other causes. As they form, however, more than a moiety of all the accidents assignable to causes under the control of the companies, it may be important to view this group of casualties by itself. And the following abstract will show the ratio of collisions in different periods:—

ABSTRACT L.

PERIOD.	Number of Passengers.	Collisions, not at Stations.		Collisions at Stations.	
		Number of Killed.	Being one in	Number of Killed.	Being one in
1840–43.....	57,617,578	7	8,231,082	6	9,602,929
1844–47.....	156,698,002	11	14,245,273	11	14,245,273
1848–51.....	264,173,027	8	33,021,628	16	16,510,814
1840—1851	478,488,607	26	18,403,408	33	14,499,655

An examination of the fourth and sixth columns of this abstract shows, that even this class of accidents, on which so much importance has been placed, is rapidly diminishing in amount, the deaths by collisions at stations having, in the last period of observations above enumerated, decreased to about 58 per cent. of the ratio in the first period; and those by other collisions having actually been reduced in the most recent period, to only 25 per cent. of their ratio in the earliest period. These results are of great importance; and while they are very satisfactory in showing a diminution of deaths from all kinds of collisions, they are further practically useful in proving, that while the deaths have been reduced to one-fourth in one group of collisions, they have undergone a reduction to the extent of 42 per cent. only in the collisions at stations. This ought to awaken attention to this latter group of accidents; and those entrusted with the general superintendence of the stations should have the subject forced on their attention.

Collisions of railway trains being one of the many causes of accidents which come so obviously under the control and management of

the companies, they have been thought of sufficient importance to justify a very minute analysis of them, with the view of pointing out the peculiar circumstances under which they usually take place, and thereby to be suggestive of means for their prevention for the future.

In this part of the inquiry, it has been found impossible to pursue the subject further back than the beginning of 1844; and, therefore, the observations will be confined to the nine years 1844—52 inclusive. Collisions, as may be easily supposed, take place under a great variety of circumstances; and it is often a difficult matter to arrange them under any well defined system of classification; consequently, in the following tables, such cases only were included in the respective groups, as distinctly and unmistakably contained some common and important characteristic, and all anomalous cases are, therefore, placed in a miscellaneous group by themselves.

Heretofore, in using the word accidents, it has meant accident to life, and has been used synonymously with "loss of life" or death; but many collisions take place unattended with fatal consequences; and, although we shall hereafter show the loss of life consequent to each kind of collision, still it is important to discuss, in the first place, the conditions under which collisions of various kinds do take place,—therefore, in the following Table, XXII., no notice is taken of the number of persons killed and injured.

In treating of the deaths of passengers in the preceding part of this paper, it was assumed that all collisions were due to causes over which the company had control; but, in the following table, it will be seen, that of the 174 classified collisions, as many as 28 took place under circumstances which it is, to a very great degree, impossible to control, and, in fact, the collisions were of a nature, against which it would at all times be exceedingly difficult to use precautions which would effectually prevent them. They will be found in Section A of the following table, and are all more or less accounted for by the state of the weather. Fog-signals, and some other appliances, might, in a few of these instances, be made available; but in the majority of the cases it is difficult to suggest a certain remedy.

Sections B and C of this table may be considered to embrace collisions, the causes of which are certainly, to a very great extent, completely under the control of the companies; and it must appear to every inquirer that, of the 34 collisions in Section B, the great bulk were absolutely preventable by a sufficient amount of care. For example, of the 18 collisions enumerated in columns (*a*), (*b*), (*c*), and (*d*) of this section, 15 are due to portions of the trains becoming detached, and 3 to defective "breaks;" and it is difficult to conceive any sufficient reason to justify a continuance or repetition of accidents from these causes. No doubt the couplings of carriages may, under extraordinary circumstances, be found to give way, even when great vigilance has been used; but such an excuse can be of no avail in the face of so many accidents of this kind as are now under consideration, and there certainly does appear strong reason to condemn the system of management which permits a series of collisions from these causes. Again, it will be found, that no less than 16 collisions took place, owing to the trains having been retarded by accidents to some portion or other of the engine. It is, no doubt, sometimes difficult to deter-

Table XXII.

An Analysis of Causes of Collisions on Railways in Great Britain and Ireland, from 1844 *to* 1852, *inclusive.*

Year.	Not under Control of the Companies.			Partly under Control.	Entirely, or to a very great extent, under Control of the Companies.														
	A. State of the Weather.				B. Defects of Machinery.					C. Neglect.							D. Other Causes.		
					Coupling Chains.			Breaks.	Engine.										
	(a.) Fog or Storm.	(b.) Rails Slippery, (generally caused by Fog.)	(c.) Train retarded by Wind, and overtaken.	(d.) Waggons or Parts of Trains Blown on to Line. Generally Neglect of Pointsmen.	(a.) Part of Train becoming detached on Incline and running back.	(b.) Part of Train becoming detached and left on Line.	(c.) Train giving way in or about Middle. Hinder part running into Fore part by its own Impetus.	(d.) Faulty Breaks.	(e.) Train or Engine retarded or stopped by Accident to Engine.	(a.) Of Signals Generally.	(b.) Of Engine Driver, by either Neglecting Signals or Careless Driving.	(c.) Of Breaksman, (sometimes with Driver.)	(d.) Of Pointsmen, or Points not Acting.	(e.) Of Station-Masters, sometimes in conjunction with others.	(f.) Waggons or Parts of Trains left on Line.	(a.) Train lost Speed and was overtaken.	(b.) Steam or Water Failed.	(c.) Miscellaneous, and not specified, but all attributable to Neglect on the part of Servants of the Companies.
1844	4	2	1	1	....	1	....	1	1	1	....	....	....	1	3	....	....	2
1845	1	1	....	2	....	....	....	....	1	2	7	....	....	....	1	1	....	11
1846	2	....	....	....	....	....	1	1	2	3	6	1	1	1	3	2	1	11
1847	....	3	....	....	....	1	....	....	3	4	6	2	5	1	2	....	3	10
1848	....	....	....	....	1	....	....	....	3	....	7	....	3	1	2	....	....	19
1849	1	....	....	1	2	1	....	....	....	3	1	....	1	....	2	....	1	15
1850	2	....	....	2	2	....	....	....	....	2	6	....	1	....	1	....	....	26
1851	1	1	....	....	1	1	1	....	5	1	5	....	2	....	1	....	....	19
1852	....	2	....	1	....	1	2	1	1	2	9	1	2	....	1	....	....	21
Totals	11	9	1	7	6	5	4	3	16	18	47	4	15	4	16	3	5	134

mine on inspection, the defects in the mechanism of an engine, still the collisions from this cause have been so many, that it is impossible to conceive a due amount of scrutiny to have been always exercised in the determination of the state of the locomotives. Greater precautions have of late years been taken to guard against this class of accidents, and greater knowledge also now exists as to what constitutes durability and efficiency in many parts of the machinery; it is, therefore, to be hoped, that still further improvements will, in these respects, yet take place, and prevent collisions from any such causes. In fact, an examination of column (*e*), Section B, of this table is sufficient to show, that during the last four years a marked improvement has taken place.

The collisions in the five years 1844–48, from the causes now under consideration	= 10, and
In the four years 1849–52	= 6

But in the former period, the extent of railway mileage was to that in the latter as 15,337 to 25,529, and consequently if this kind of collision had taken place in the latter period in the same ratio as in the former, the number would have been nearly 17, while, in fact, it amounted to only 6. And there appears no sufficient reason why this improvement should not continue until all such accidents, or nearly all, should disappear.

The next Section, C, of this table includes a class of collisions of a most serious character, and of an alarming extent. It is, perhaps, impossible to bring any direct charge against the directors and superior officers, on account of the culpable neglect on the part of the inferior servants, to which these accidents are immediately due; but the very enormous extent of them should call forth some more effective system of supervision for enforcing a faithful and certain observance of the regulations of the companies. Of the 174 collisions, of which the causes are classified in Table XXII., the extraordinary number of 104 have arisen out of what can be described as nothing but the most culpable neglect.

18 are due either to the neglect or mismanagement of signals.
47 have arisen from drivers neglecting signals, and other kinds of careless driving.
4 are due to the omission of the use of the "break."
15 are owing to pointsmen neglecting their duty.
4 are owing to the neglect or carelessness of station masters. And
16 have been occasioned by the inexcusable neglect of leaving waggons and portions of trains on the line, when the same line was in use by other trains; this last cause has, however, nearly disappeared during the three years 1850–52, not more than one collision yearly having taken place.

In Section D, the last of Table XXII., it will be found that column (*c*) contains no less than 134 cases of collisions, which it has been found impossible to classify in a satisfactory manner; but they are all attributable to neglect on the part of the servants of the companies.

The facts recorded in this table are of grave importance; and, although the directors of railway companies have done an immense deal in recent years to protect passengers against loss of life and limb, they are still imperatively called on to take the subject of the fre-

quently recurring collisions more thoroughly into consideration than they have yet done. When such most culpable neglect exists, as is evident by this table, the public have a right to demand more complete protection.

The next table to be considered is Table XXIII., which follows the same principles of classification as the table immediately preceding, only that in addition, the number of deaths and injuries due to each kind of collision is specified, for *employés* as well as passengers.

From this table a very clear notion may be formed of the danger to life and limb of passengers by collisions taking place from different causes. It would appear that—

(A.) The 28 collisions, from causes assignable to the state of the weather, produced	2	deaths and	69	injuries.
(B.) The 34 collisions, from defects and breakage of machinery, produced	11	,,	208	,,
(C.) The 104 collisions, arising from classified causes of neglect in railway servants, produced	21	,,	305	,,
(E.) And the 134 collisions arising from unclassified causes, produced	16	,,	581	,,

It hence follows, that in each of the above groups the ratios of deaths and injuries to passengers were as follows:—

In group	(A),	each collision produced	·071	deaths and 2·464	injuries.
,,	(B),	,,	·324	,, 6·118	,,
,,	(C),	,,	·202	,, 2·933	,,
,,	(E),	,,	·119	,, 4·336	,,

And Group B, or collisions arising from defects and breakage of machinery, has evidently the greatest tendency to occasion not only death, but likewise injuries to passengers, in relation to the number of collisions. This is not quite in accordance with the features attendant on railway accidents generally, in which it will be observed that those causes usually most fatal to life are accompanied with a reduced ratio of injuries. This will appear in a strong light when the part of this inquiry, relating to *employés*, is considered.

An examination of the final columns of Table XXIII. will show that the ratio which the number of injuries bears to the number of deaths arising from collisions differs very widely from that from accidents from all causes, as exhibited in Abstract G., both as regards passengers and servants of the companies.

Class of Accidents.	The Ratio of Injured to Killed among	
	Passengers.	Employés.
All causes in the aggregate	675·20 per cent.	65·03 per cent.
Collisions only	2301·96 ,,	225·49 ,,

It hence follows that the injuries greatly exceed the deaths amongst passengers in both of the above classes of accidents. On the other hand, the deaths amongst employés exceed the injuries from all causes in the aggregate; but in the class of collisions, the injuries, as with passengers, much exceed the number of deaths.

Table XXIII.

Showing the Number of Deaths and Injuries, to Railway Employés and to Passengers, due to each cause of Collision, on the Railways of Great Britain and Ireland, from the Year 1844 to the Year 1852, inclusive.

Year.	A. Weather. — a, b, c. Not under Control of the Companies. Number of Collisions.	Emp. Killed.	Emp. Injured.	Pass. Killed.	Pass. Injured.	A. Weather. — d. Partly under their Control. Number of Collisions.	Emp. Killed.	Emp. Injured.	Pass. Killed.	Pass. Injured.	A. Weather. — Total. Number of Collisions.	Emp. Killed.	Emp. Injured.	Pass. Killed.	Pass. Injured.
1844	7	...	1	...	12	1	...	...	...	...	8	...	1	...	12
1845	2	...	...	...	4	2	...	...	...	...	4	...	...	...	4
1846	2	1	...	...	4	...	...	...	...	...	2	1	...	...	4
1847	3	...	1	2	1	...	...	...	...	...	3	...	1	2	1
1848	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1849	1	1	1	...	...	1	...	...	...	...	2	1	1	...	...
1850	2	...	1	...	19	2	...	...	...	12	4	...	1	...	31
1851	2	1	...	...	4	...	...	...	...	...	2	1	...	...	4
1852	2	...	2	...	13	1	...	...	...	...	3	...	2	...	13
Totals	21	3	6	2	57	7	...	...	...	12	28	3	6	2	69

Year.	B. Defects or Breakage of Machinery. Number of Collisions.	Emp. Killed.	Emp. Injured.	Pass. Killed.	Pass. Injured.	D. Loss of Speed, or Steam or Water Failed. Number of Collisions.	Emp. Killed.	Emp. Injured.	Pass. Killed.	Pass. Injured.
1844	3	1	...	1	4	...	...	...	...	...
1845	1	...	...	...	...	1	...	...	1	...
1846	4	1	4	2	6	3	...	3	...	...
1847	4	1	...	...	...	3	...	...	...	11
1848	4	1	2	...	19	...	...	...	...	...
1849	3	1	1	...	6	1	...	...	...	...
1850	2	4	...	...	1	...	...	...	...	...
1851	8	...	...	8	116	...	...	...	...	...
1852	5	3	...	...	56	...	...	...	...	...
Totals	34	12	7	11	208	8	...	3	1	11

Year.	Neglect. — C. From known Causes. Number of Collisions.	Emp. Killed.	Emp. Injured.	Pass. Killed.	Pass. Injured.	Neglect. — E. From Miscellaneous and unascertained Causes. Number of Collisions.	Emp. Killed.	Emp. Injured.	Pass. Killed.	Pass. Injured.	Neglect. — Total. Number of Collisions.	Emp. Killed.	Emp. Injured.	Pass. Killed.	Pass. Injured.	Grand Total. Number of Collisions.	Emp. Killed.	Emp. Injured.	Pass. Killed.	Pass. Injured.
1844	5	...	5	2	35	2	...	1	2	9	7	...	6	4	44	18	1	7	5	60
1845	10	3	4	3	36	11	...	3	...	26	21	3	7	3	62	27	3	7	4	66
1846	15	...	15	...	39	11	...	6	2	28	26	...	21	2	67	35	2	28	4	77
1847	20	1	8	7	22	10	4	...	...	7	30	5	8	7	29	40	6	9	9	41
1848	13	4	12	6	52	19	2	8	1	34	32	6	20	7	86	36	7	22	7	105
1849	7	2	3	...	2	15	2	2	...	58	22	4	5	...	60	28	6	7	...	66
1850	10	...	4	...	12	26	6	9	8	93	36	6	13	8	105	42	10	14	8	137
1851	9	3	3	...	28	19	3	1	1	153	28	6	4	1	181	38	7	4	9	301
1852	15	4	8	3	79	21	2	7	2	173	36	6	15	5	252	44	9	17	5	321
Totals	104	17	62	21	305	134	19	37	16	581	238	36	99	37	886	308	51	115	51	1174

The letters at head of the columns refer to those in the Analysis of Causes of Collisions. The accidents in (col. A_d) would, probably, be always traceable to Neglect of Pointsmen. Those in (col. D) would be, in general, attributable to Neglect.—See Analysis of Causes.

A curious and very interesting analysis of railway collisions will be found in the two next succeeding Tables, XXIV. and XXV.

TABLE XXIV.

Showing the Number of Collisions in each Year, from 1844 *to* 1852, *inclusive, with Number of Employés and Passengers Killed and Injured thereby.*

YEAR.	*a.* Passenger into Passenger.					*b.* Passenger into Other.					*c.* Other into Passenger.					*d.* Other into Other.					Totals.				
	Number of Collisions.	Employés.		Passengers.		Number of Collisions.	Employés.		Passengers.		Number of Collisions.	Employés.		Passengers.		Number of Collisions.	Employés.		Passengers.		Number of Collisions.	Employés.		Passengers.	
		Killed.	Injured.	Killed.	Injured.		Killed.	Injured.	Killed.	Injured.		Killed.	Injured.	Killed.	Injured.		Killed.	Injured.	Killed.	Injured.		Killed.	Injured.	Killed.	Injured.
1844	4	....	5	3	34	10	1	2	2	17	3	....	....	....	7	1	....	....	....	2	18	1	7	5	60
1845	4	....	....	1	6	13	1	3	....	24	8	1	2	3	36	2	1	2	....	....	27	3	7	4	66
1846	2	....	....	....	3	19	1	14	2	39	3	....	3	1	35	11	1	11	1	....	35	2	28	4	77
1847	6	....	1	....	17	18	2	3	9	19	3	....	....	....	5	13	4	5	....	....	40	6	9	9	41
1848	7	....	2	1	23	17	5	11	6	62	6	1	2	....	18	6	1	7	....	2	36	7	22	7	105
1849	4	....	....	....	13	14	1	1	....	16	3	....	....	....	36	7	5	6	....	1	28	6	7	....	66
1850	8	....	1	5	52	16	3	7	1	55	13	5	1	....	29	5	2	5	2	1	42	10	14	8	137
1851	7	....	....	6	156	23	5	3	....	80	6	....	....	3	65	2	2	1	....	....	38	7	4	9	301
1852	6	....	1	2	25	26	2	14	2	243	6	....	....	1	53	6	7	2	....	....	44	9	17	5	321
Totals	48	....	10	18	329	156	21	58	22	555	51	7	8	8	284	53	23	39	3	6	308	51	115	51	1,174

Of the 308 collisions recorded in Table XXIV., it will be found that—

(*a.*) 48 have consisted of one passenger train coming into collision with another.
(*b.*) 156 have consisted of collisions by passenger trains running into trains of another description, such as luggage, coke, mineral, contractors', &c., trains.
(*c.*) 51 have been occasioned by other than passenger trains running into passenger trains. And
(*d.*) 53 collisions happened by trains, not passenger trains, running into other trains, which were also not passenger trains.

It may be said, that in all the preceding four groups the public, as passengers, were interested, and even the last group, it will be found, records that three passengers were killed and six injured, although the trains were not passenger-trains. These deaths and injuries took place amongst persons in charge of horses and cattle.

A very characteristic distinction in the number of collisions, under Groups (*b*) and (*c*), is observable. Group (*b*) shows the number of passenger-trains running into others not passenger-trains, while group (*c*) is the converse kind of collision. Now as passenger-trains usually run at a higher speed than the other trains, the greater number of collisions is occasioned by the passenger-trains overtaking the others, the difference being almost exactly three times as great.

What is also somewhat curious to observe in the table under consideration is, the rather close approximation in the number of collisions with each other of trains of a similar kind. The collisions among exclusively passenger-trains were, in the nine years, exactly 48; and the collisions in the same period among trains, exclusively other than passenger-trains, were 53.

The following shows the ratio of deaths and injuries among passengers in each group of collisions in Table XXIV:—

In group	(*a*),	each collision produced	·375	deaths and	6·854	injuries.
,,	(*b*),	,,	·141	,,	3·558	,,
,,	(*c*),	,,	·157	,,	5·569	,,
,,	(*d*),	,,	·057	,,	0·113	,,

The highest ratio of deaths, and also of injuries, in the above four combinations, will be found in Group (*a*); and for this there is a very obvious explanation, for the collision in this group consists of one passenger-train running into another; consequently, in every such collision, taking one with another, there will be double the number of passengers exposed to risk, which will be found exposed to such risks in collisions under Group (*b*); and it is rather singular to find, in an inquiry of this kind, so very positive a determination to the development of a law of mortality, when so many disturbing causes might have been considered to influence the results. If the ratio of deaths and injuries in Group (*a*) be divided by two, the results will be, ratio of deaths ·187, and ratio of injuries 3·427, not differing widely from the results of Group (*b*), nor from the results of Group (*c*), so far as regards deaths.

Another obvious and important result, arising out of this table, is the caution indicated in regard to the position of passenger to other trains on the line; for it is the mismanagement of this detail which occasions fully one-half of the whole collisions which take place.

Table XXV.

Showing the Number of Collisions occurring to each class of Passenger Train, as compared with those occurring to all Passenger Trains, and to each other, with the Deaths and Injuries occasioned thereby, from 1844 to 1852, inclusive.

Year.	a. Express.						b. Mail.						c. Ordinary Passenger Trains.						d. Excursion.						Total. (a + b + c + d.)					
	Number of Collisions.		Employés.		Passengers.		Number of Collisions.		Employés.		Passengers.		Number of Collisions.		Employés.		Passengers.		Number of Collisions.		Employés.		Passengers.		Number of Collisions.		Employés.		Passengers.	
	Not resulting in Injuries.	Resulting in Injuries.	Killed.	Injured.	Killed.	Injured.	Not resulting in Injuries.	Resulting in Injuries.	Killed.	Injured.	Killed.	Injured.	Not resulting in Injuries.	Resulting in Injuries.	Killed.	Injured.	Killed.	Injured.	Not resulting in Injuries.	Resulting in Injuries.	Killed.	Injured.	Killed.	Injured.	Not resulting in Injuries.	Resulting in Injuries.	Killed.	Injured.	Killed.	Injured.
1844....	....	....	....	....	....	....	3	....	....	....	....	....	3	10	1	7	4	57	....	1	....	....	1	1	6	11	1	7	5	58
1845....	....	....	....	....	....	....	....	2	....	....	....	4	4	19	2	5	4	62	....	....	....	....	....	....	4	21	2	5	4	66
1846....	....	1	....	2	....	....	1	1	....	....	....	4	6	15	1	15	3	73	....	....	....	....	....	....	7	17	1	17	3	77
1847....	1	1	....	....	....	1	3	....	....	....	....	....	6	15	2	4	9	32	....	1	....	....	....	8	10	17	2	4	9	41
1848....	1	2	1	4	1	10	1	4	4	6	....	4	6	16	1	5	6	89	....	....	....	....	....	....	8	22	6	15	7	103
1849....	....	....	....	....	....	....	....	1	....	....	....	1	7	11	1	1	....	62	1	1	....	....	....	2	8	13	1	1	....	65
1850....	....	....	....	....	....	....	....	2	....	....	....	10	5	30	8	9	6	126	....	....	....	....	....	....	5	32	8	9	6	136
1851....	....	1	....	....	....	1	....	1	....	....	....	2	3	27	5	3	9	235	....	4	....	....	....	63	3	33	5	3	9	301
1852....	1	3	1	5	....	14	....	2	....	2	....	11	2	30	1	8	5	296	....	....	....	....	....	....	3	35	2	15	5	321
Totals	3	8	2	11	1	26	8	13	4	8	....	36	42	173	22	57	46	1,032	1	7	....	....	1	74	54	201	28	76	48	1,168

The next Table, XXV, gives a still further analysis of the passenger-trains, by showing the number of collisions to each kind of train, whether "express," "mail," "excursion," or ordinary train; and further distinguishes, among the collisions to each of these trains, the number which have resulted in injury to life or limb, and the number of collisions unattended with injury. Other than passenger-trains are excluded.

In this table, it will be observed, that the collisions of the "express" and "excursion" trains have occasioned but one death each throughout the whole period of nine years, while the collisions of "mail" trains were not attended with a single death to a passenger. So far as collisions are concerned, this ought to satisfy the minds of the timid of the safety of travelling by quick trains.

The following is a condensed abstract of Table XXV., in respect to passengers only:—

ABSTRACT M.

Trains.	Number of		Number of Passengers.		Ratio of Deaths and Injuries to			
	Non-serious Collisions.	Serious Collisions.	Killed.	Injured.	All Collisions.		Serious Collisions.	
					Killed.	Injured.	Killed.	Injured.
Express	3	8	1	26	·091	2·364	·125	3·250
Excursion	1	7	1	74	·125	9·250	·143	10·571
Mail.....	8	13	....	36	....	1·714	....	2·769
Ordinary	42	173	46	1,032	·214	4·800	·266	5·965
Total ...	54	201	48	1,168	·188	4·580	·239	5·811

It will thus be seen, that the ordinary trains have been fatal to life above the average. It will, however, be observed, that although the excursion trains have occasioned fewer deaths than the ordinary trains, yet the ratio of persons injured is nearly double the average. It will, likewise, be observed, that one-fifth part of all the collisions with passenger-trains are unattended with injury.

The following Table, XXVI., which includes collisions by other as well as passenger-trains, is interesting.

One remarkable feature in this table is, the disparity in the frequency of collisions in different months of the year. It will be seen that, in the six months commencing with August and ending with January, the number of collisions is more than double of the number in the other six months of the year. This is, no doubt, to be in part accounted for by the state of the weather, as may be understood on referring to Section A of Tables XXII. and XXIII.; but this would still not of itself be sufficient to account for the remarkable difference observable in the preceding table, unless it be that the "neglect," recorded in Section C of Table XXII. and Section E of Table XXIII., be also to some extent occasioned by the trying nature of the weather at the same season. Another curious circumstance is the fact that in the last six months of this table, in which double the number of collisions have taken place, not quite so many lives of passengers have been lost, although the passenger traffic of the same six months is

TABLE XXVI.

Showing the Number of Collisions on the Railways of Great Britain and Ireland for the nine Years 1844—1852, *for each Month of the Year, with the Number of Employés and of Passengers Killed and Injured thereby.*

Month.	Number of Collisions.			Employés.		Passengers.	
	Total.	Not resulting in Injury to Life or Limb.	Resulting in Injuries.	Killed.	Injured.	Killed.	Injured.
February	13	4	9	2	6	....	15
March	15	4	11	2	2	....	30
April	10	3	7	....	4	6	110
May	21	4	17	4	....	11	75
June	15	....	15	3	8	7	57
July	25	4	21	3	17	2	127
Totals	99	19	80	14	37	26	414
August	37	7	30	3	12	11	200
September	32	4	28	7	7	3	137
October	35	8	27	8	18	4	102
November	36	8	28	5	16	3	177
December	41	11	30	7	15	4	103
January	28	12	16	7	10	....	41
Totals	209	50	159	37	78	25	760
Totals of 12 months....	308	69	239	51	115	51	1,174

greater than in the other six months. For the nine years now under consideration, the passenger traffic of the first six months was 240,307,731, the passenger traffic of the second six months was 302,959,421. And, consequently, the deaths from collisions, during the first six months, were 1 in every 9,242,605 passengers; and, during the second six months, were 1 in every 12,118,577 passengers. So that those figures represent the relative chances of loss of life from collisions in railway travelling during the respective seasons, assuming that such accidents should for the future observe the same order of distribution.

In respect of injuries to passengers, it will be observed, that in frequency they follow almost the precise order of the collisions themselves—the ratio to collisions in the different seasons being nearly the same. The facts in this table are well worth examination by those intrusted with the management of railways. It is scarcely possible to conceive that any intelligent superintendent of the trains of a railway, who thoroughly masters the facts in regard to collisions contained in Tables XXII. to XXVI. inclusive, could not devise some means which would prevent the recurrence of so many accidents of this class.

The only remaining table now to be brought forward on the subject of collisions is the following one, Table XXVII. in which are shown the places on the line at which the various collisions have taken place.

Table XXVII.

Showing the Localities *where all Collisions, from* 1844 *to* 1852, *inclusive, occurred, with the Deaths and Injuries to Railway Employés and to Passengers caused thereby; also the Number of Collisions unattended or attended by Injury for each of the above Years.*

Year.	*a.* At or near Station or Terminus.						*b.* At or near Junction.						*c.* At Sidings or Crossings.						*a + b + c.* Total of Stations, Junctions, and Crossings.						On Open Line.						Grand Total.					
	Number of Collisions.		Employés.		Passengers.		Number of Collisions.		Employés.		Passengers.		Number of Collisions.		Employés.		Passengers.		Number of Collisions.		Employés.		Passengers.		Number of Collisions.		Employés.		Passengers.		Number of Collisions.		Employés.		Passengers.	
	Not resulting in Injury.	Resulting in Injury.	Killed.	Injured.	Killed.	Injured.	Not resulting in Injury.	Resulting in Injury.	Killed.	Injured.	Killed.	Injured.	Not resulting in Injury.	Resulting in Injury.	Killed.	Injured.	Killed.	Injured.	Not resulting in Injury.	Resulting in Injury.	Killed.	Injured.	Killed.	Injured.	Not resulting in Injury.	Resulting in Injury.	Killed.	Injured.	Killed.	Injured.	Not resulting in Injury.	Resulting in Injury.	Killed.	Injured.	Killed.	Injured.
1844	1	1	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	3	5	11	1	7	5	57	6	12	1	7	5	60
1845	1	6	1	2	1	14	...	1	...	...	...	3	...	3	...	2	...	9	1	10	1	4	1	26	3	13	2	3	3	40	4	23	3	7	4	66
1846	3	8	...	9	1	42	...	...	...	...	...	...	...	3	...	6	...	21	3	11	...	15	1	63	9	12	2	13	3	14	12	23	2	28	4	77
1847	2	6	2	2	...	16	...	...	...	...	...	...	2	4	...	3	7	7	4	10	2	5	7	23	13	13	4	4	2	18	17	23	6	9	9	41
1848	2	14	...	6	7	76	2	1	...	...	...	1	1	4	1	1	...	4	5	19	1	7	7	81	5	7	6	15	...	24	10	26	7	22	7	105
1849	2	6	1	1	...	35	...	2	1	1	...	4	...	1	...	...	...	1	2	9	2	2	...	40	7	10	4	5	...	26	9	19	6	7	...	66
1850	1	21	2	9	6	100	...	1	1	...	...	...	...	...	...	...	...	...	1	22	3	9	6	100	4	15	7	5	2	37	5	37	10	14	8	137
1851	1	16	4	4	1	127	...	2	1	...	...	9	...	1	1	...	...	...	1	19	6	4	1	136	1	17	1	...	8	165	2	36	7	4	9	301
1852	1	18	5	9	2	169	...	3	...	1	1	27	...	2	...	...	...	2	1	23	5	10	3	198	3	17	4	7	2	123	4	40	9	17	5	321
Totals	14	96	15	42	18	582	2	10	3	2	1	44	3	18	2	12	7	44	19	124	20	56	26	670	50	115	31	59	25	504	69	239	51	115	51	1,174

It will be found that, of a total number of 308 collisions, no less than 110 have taken place at stations, or the very places where the greatest care and vigilance are required and might be exercised. Anything like fair attention to the use of well understood precautions, and a proper use of signals and telegraphs, should completely, or at all events to a great extent, prevent this class of accidents. The same remarks may be justly made in respect to the collisions recorded in Sections *b* and *c* of the same table. The collisions in the first three sections of this table constitute about 46 per cent. of the whole number, and are clearly of a kind that may be greatly diminished by a well devised system of management. The accidents from collisions on open lines, or rather at other places than stations, junctions, sidings, and crossings, amount to 165. The intensity of the different kind of collisions in this table, in death and injury, does not exhibit any very marked disparity.

The only other important class of accidents, from which passengers suffer, and assumed to be under the control or management of the companies, are those occasioned by trains, or portions of trains, running off the line.

Of the 228 defined causes of deaths of passengers, given in Table XIII., it will be found that 109 are attributable to causes under control of the companies. And then, again, Table XIII. shows that 35, or 32·1 per cent., were occasioned by "running off the line." In so far as the management of railways is concerned, in preserving the lives of passengers, this class of accidents is second only in importance to that arising from collisions. In fact, "collisions" and "running off the line" caused 91 per cent. of all the deaths of passengers for which the companies can be supposed responsible; and therefore, a thorough analysis of these two classes of accidents will complete the inquiry so far as the lives of passengers are concerned.

In the following Table, XXVIII., will be found the results of the investigation made into the immediate cause of engines, trains, and other parts of trains running off the line. The analysis will be found sufficiently minute and detailed for every useful purpose.

Of 156 cases of "running off the line," the immediate cause has been ascertained in 105 instances. And it is also found, that 105 of the accidents have been attended with injury to life and limb of passengers, and 51 resulted without any injury.

It will immediately appear on examination of Section A of the same table, as remarked in regard to the similar section of the tables of collisions, that it is impossible to hold the companies responsible for every one of this group of accidents. They are so clearly due to causes difficult to be foreseen, that they may for the present be passed over as such.

But in regard to Section B, which includes none but cases of running off the line from the breaking of machinery, there can be no doubt that greater precautions might generally be taken. The remarks offered on the "breaking of machinery," as the immediate cause of collisions, apply with equal force in this instance, and need not again be repeated; but it is certainly to be lamented that, of the 105 ascertained causes of "running off the line," no less than 43 should be due

TABLE XXVIII.

An Analysis of Causes of Engines, Trains, or Parts of Trains, running off the Rails, on Railways in Great Britain and Ireland from the Year 1844 to the Year 1852, inclusive.

Year.	A. Weather. Floods or Damage caused thereby. Number of Accidents. Not resulting in Injury.	Resulting in Injury.	Ballast washed away by Heavy Rain. Not resulting in Injury.	Resulting in Injury.	Subsidence of Embankment. Not resulting in Injury.	Resulting in Injury.	B. Machinery Breaking. Engines. Axles. Leading. Not resulting in Injury.	Resulting in Injury.	Axles. Other. Not resulting in Injury.	Resulting in Injury.	Wheels. Leading. Not resulting in Injury.	Resulting in Injury.	Wheels. Other. Not resulting in Injury.	Resulting in Injury.	Crank. Not resulting in Injury.	Resulting in Injury.	Connecting Rod. Not resulting in Injury.	Resulting in Injury.	Other Accidents. Not resulting in Injury.	Resulting in Injury.
1844..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
1845..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	..
1846..	..	..	..	..	1	1	..	1	..	1	..	..	1	..	..	..	..	1	..	1
1847..	..	..	..	..	1	..	..	1	2	1	..	..	..	1	..	1	..	..	..	..
1848..	..	..	..	2	..	..	..	..	..	..	..	..	..	2	..	1	..	..	1	..
1849..	1	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
1850..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
1851..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
1852..	..	1	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..
Totals	1	2	..	2	2	1	1	2	4	2	..	3	1	4	..	2	..	1	1	2

Year.	B. Tenders. Axles. Number of Accidents. Not resulting in Injury.	Resulting in Injury.	Tenders. Whls. Not resulting in Injury.	Resulting in Injury.	Carriages and Trucks. Axles. Not resulting in Injury.	Resulting in Injury.	Carriages and Trucks. Whls. Not resulting in Injury.	Resulting in Injury.	C. Defects in Permanent Way. Points or Switches Open, Defective, or Unattended to. Not resulting in Injury.	Resulting in Injury.	Rail-Joints, Sprung Rail, or Rails out of Guage &c. Not resulting in Injury.	Resulting in Injury.	Rails broken or torn up. Not resulting in Injury.	Resulting in Injury.	Line under Repair. Not resulting in Injury.	Resulting in Injury.	Bridge sunk, or gave way. Not resulting in Injury.	Resulting in Injury.	Bad State of Road in General. Not resulting in Injury.	Resulting in Injury.
1844..	..	1	..	..	..	..	1	..	1	1	1	..	..	..	..	..	..	..	..	..
1845..	..	..	..	..	..	..	..	1	..	..	..	3	..	..	1	1	..	..	..	..
1846..	..	1	..	..	1	..	1	2	1	..	..	1	..	..	..	..	..	1	..	..
1847..	..	..	1	..	1	1	2	..	2	1	1	1	1	..	1	..	..	..	..	1
1848..	..	..	..	..	..	..	1	..	1	1	..	..	1	..	..	..	..	..	..	..
1849..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..
1850..	..	..	..	..	..	1	..	1	..	1	..	..	2	1	..	..	..	..	..	..
1851..	1	..	..	..	..	1	..	..	1	2	..	..	..	..	..	..	..	..	..	..
1852..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Totals	1	2	1	..	2	3	5	6	6	6	2	6	4	1	2	1	..	1	..	1

Year.	D. Obstructions on Road. Left, or Fallen on Line. Number of Accidents. Not resulting in Injury.	Resulting in Injury.	Placed on Maliciously. Not resulting in Injury.	Resulting in Injury.	Contact with Cattle. Not resulting in Injury.	Resulting in Injury.	E. Reckless Driving, or Excessive Speed. Not resulting in Injury.	Resulting in Injury.	F. Miscellaneous. Not resulting in Injury.	Resulting in Injury.	G. Cause not ascertained. Not resulting in Injury.	Resulting in Injury.	Total Number in each Year.
1844..	..	1	..	..	1	1	..	1	..	..	..	..	10
1845..	..	2	..	1	1	..	..	..	..	..	1	2	15
1846..	1	..	..	..	..	..	..	2	..	..	1	4	23
1847..	2	..	..	..	..	..	..	..	1	2	..	6	31
1848..	..	..	..	..	1	..	..	..	..	..	5	6	22
1849..	..	..	..	..	..	..	..	1	..	..	1	3	10
1850..	..	2	..	..	..	..	..	..	..	..	1	4	14
1851..	..	1	..	1	..	..	..	..	..	..	1	7	16
1852..	1	..	..	..	..	..	..	..	..	1	..	9	15
Totals	4	6	..	2	3	1	..	4	1	3	10	41	156

to "breaking of machinery." Frequent inspection by competent parties is the protection against this group of accidents, and strong measures should be enforced to secure the safety arising from this sort of surpervision.

The accidents arising from causes recorded in Section C are certainly all, or at least to a very great extent, preventable. Nothing but the most culpable indifference to the public safety can permit a continuance of this group of accidents, which forms upwards of 28 per cent. of all the classified accidents in this table.

The accidents included in Columns 2 and 3, of Section D, cannot in general be attributable to negligence of the companies.

The four cases in Section E are due to reckless driving.

Sections B and C of this table should be well considered by railway directors.

The next, Table XXIX., will show how the various groups of accidents of "running off the line" affected life and limb of passengers.

What is strange in the record of accidents contained in this table is, that the 51 cases, included in Sections A and B, did not occasion a single death of a passenger, while the 30 in Section C,

TABLE

Showing the Number of Deaths and Injuries, to Railway Employés and to Passengers, due in Great Britain and

	A. Weather.					B. Machinery Breaking. *a.* Engines.					*b.* Tenders.					*c.* Carriages, or Trucks, &c.					*d.* Totals.					C. Defects in Permanent *a.* Rails, Points, and Switches.					*b.* Bad Road, or under Repair.				
	Number of Accidents.	Emp. Killed.	Emp. Injured.	Pass. Killed.	Pass. Injured.	Number of Accidents.	Emp. Killed.	Emp. Injured.	Pass. Killed.	Pass. Injured.	Number of Accidents.	Emp. Killed.	Emp. Injured.	Pass. Killed.	Pass. Injured.	Number of Accidents.	Emp. Killed.	Emp. Injured.	Pass. Killed.	Pass. Injured.	Number of Accidents.	Emp. Killed.	Emp. Injured.	Pass. Killed.	Pass. Injured.	Number of Accidents.	Emp. Killed.	Emp. Injured.	Pass. Killed.	Pass. Injured.	Number of Accidents.	Emp. Killed.	Emp. Injured.	Pass. Killed.	Pass. Injured.
1844......	...	...	...	...	...	1	1	1	...	...	1	...	...	...	2	1	...	...	...	...	3	1	1	...	2	3	...	2	...	...	...	...	...	...	...
1845......	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	1	...	...	...	1	3	...	...	...	1	3	...	5	...	5	2	1	...	...	...
1846......	2	...	2	...	...	5	1	3	...	1	1	...	1	...	...	4	1	3	...	13	10	2	7	...	14	2	...	...	...	...	1	1	1	...	2
1847......	1	...	...	...	...	6	2	3	...	...	1	...	...	...	...	4	2	...	...	...	11	4	3	...	...	6	2	2	...	...	2	...	...	2	1
1848......	2	1	2	...	4	4	1	3	...	5	...	...	...	...	...	1	...	...	...	...	5	1	3	...	5	3	...	2	...	...	...	...	...	...	...
1849......	2	...	1	...	...	1	...	...	...	...	...	...	...	...	...	2	...	...	...	16	3	...	...	...	16	...	...	...	...	...	...	...	...	...	...
1850......	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	2	...	1	...	2	3	...	1	...	2	4	...	...	...	6	...	...	...	...	...
1851......	...	...	...	...	...	1	1	1	...	...	1	...	...	...	...	1	2	...	...	...	3	3	1	...	...	3	...	...	6	23	...	...	...	...	...
1852......	1	...	2	...	...	2	3	2	...	...	...	...	...	...	...	...	...	...	...	...	2	3	2	...	...	1	...	...	...	2	...	...	...	...	...
Totals ...	8	1	7	...	4	23	9	13	...	6	4	...	1	...	2	16	5	4	...	32	43	14	18	...	40	25	2	11	6	36	5	2	1	2	3

Column A contains all those accidents which were not under the Company's control. Column C_a includes open, or were

attributable to defects in the "permanent way," produced 8 deaths of passengers.

The number of deaths of passengers from obstructions on the line was 3, but no passenger lost his life under Section E, reckless driving, or excessive speed.

The miscellaneous group, Section F, it will be seen, includes 55, or upwards of one-third, of all the cases of trains running off the rails, to which unascertained causes nearly one-half of the whole deaths of passengers from running off the line is due, but the returns of the railway department were either defective as to these cases, or the accidents themselves were of so peculiar a kind as not to admit of a satisfactory classification.

When that part of the subject, which has reference to the manner in which railway accidents have affected the employés, is considered, the effects of trains running off the line will be more fully discussed. From Tables XXIV. and XXVI., preceding, it will be observed that collisions killed an equal number of employés and passengers; but the cases of running off the line have, as will be seen by the last columns of Table XXIX., relatively a much more fatal effect on the servants of the companies.

XXIX.

to each Cause of Trains, or Parts of Trains, or Engines running off the Rails of Railways Ireland, from 1844 *to* 1852.

Way.					D. Obstructions on Line.										E. Reckless Driving, or Excessive Speed.				F.				Grand Total.			
c. Totals.					a. On or between Rails.				b. Contact with Cattle.				c. Totals.						Miscellaneous, and not ascertained.							
Number of Accidents.	Emp.		Pass.		Number of Accidents.	Emp.		Pass.		Number of Accidents.	Emp.		Pass.		Number of Accidents.	Emp.		Pass.		Number of Accidents.	Emp.		Pass.		Number of Accidents.	Emp.		Pass.	
	Killed.	Injured.	Killed.	Injured.		Killed.	Injured.	Killed.	Injured.		Killed.	Injured.	Killed.	Injured.		Killed.	Injured.	Killed.	Injured.		Killed.	Injured.	Killed.	Injured.		Killed.	Injured.	Killed.	Injured.
3	...	2	...	...	1	2	...	...	...	2	1	...	...	...	3	3	...	...	...	1	...	...	...	...	...	10	4	3	...	3
5	1	5	...	5	3	...	3	...	6	1	...	...	...	...	4	...	3	...	6	...	...	...	...	...	...	15	4	14	...	12
3	1	1	...	2	1	...	...	...	...	...	...	...	...	...	1	...	...	...	...	2	2	1	...	...	5	1	4	...	1	23	6	15	...	17
8	2	2	2	1	2	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	9	3	8	3	17	31	9	13	5	18
3	...	2	...	...	...	...	...	...	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...	...	11	5	5	2	3	23	7	12	2	12
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	4	4	...	5	1	10	4	1	5	18
4	...	...	...	6	2	...	2	...	1	...	...	...	...	...	2	...	2	...	1	...	...	...	...	...	5	...	1	...	9	14	...	4	...	18
3	...	...	6	23	2	2	...	3	3	...	...	...	...	...	2	2	...	3	3	...	...	...	...	...	8	3	4	...	22	16	8	5	9	48
1	...	...	...	2	1	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	10	7	7	...	15	15	10	11	...	17
30	4	12	8	39	12	4	5	3	10	4	1	...	...	...	16	5	5	3	10	4	2	1	...	2	55	26	35	10	68	156	52	78	21	163

cases of *neglect* in leaving points open, the effect on the train being manifestly the same whether they were left defective, &c.

Table XXX.

Showing the Number of Accidents, by Trains Running off the Line, unattended and attended with Injury, in each Year, from 1844 *to* 1852, *inclusive, occurring to each Species of Train, with the Number of Employés and Passengers Killed and Injured thereby.*

Year.	Express.						Mail.						All other Passenger Trains.						Engines.					
	Number of Accidents.		Employés.		Passengers.		Number of Accidents.		Emp.		Pass.		Number of Accidents.		Employés.		Passengers.		Number of Accidents.		Emp.		Pass.	
	Not resulting in Injury.	Resulting in Injury.	Killed.	Injured.	Killed.	Injured.	Not resulting in Injury.	Resulting in Injury.	Killed.	Injured.	killed.	Injured.	Not resulting in Injury.	Resulting in Injury.	Killed.	Injured.	Killed.	Injured.	Not resulting in Injury.	Resulting in Injury.	Killed.	Injured.	Killed.	Injured.
1844..	...	...	...	...	...	...	...	...	...	...	...	...	4	4	2	2	...	3	...	...	...	...	...	...
1845...	...	2	...	3	...	9	1	...	...	...	...	...	2	6	3	5	...	3	1	...	...	...	...	...
1846...	...	2	1	1	...	...	...	...	...	...	...	...	3	9	1	8	...	17	...	...	...	...	...	...
1847...	1	3	1	2	2	1	...	...	...	...	...	...	7	10	5	10	3	17	...	1	...	1	...	...
1848...	1	3	...	2	2	1	2	1	...	1	...	...	3	4	4	6	...	11	2	1	1	1	...	...
1849...	...	1	2	...	...	...	1	1	...	...	5	1	1	3	...	...	...	17	1	1	...	1	...	...
1850...	...	1	...	...	...	1	...	...	...	...	...	...	3	7	...	1	...	17	...	...	...	...	...	...
1851...	...	...	...	...	...	...	...	...	...	...	...	...	3	9	3	4	9	48	...	1	1	1	...	...
1852...	...	4	4	2	...	3	...	1	2	2	...	...	1	7	4	4	...	14	...	1	...	1	...	...
Totals	2	16	8	10	4	15	4	3	2	3	5	1	27	59	22	40	12	147	4	5	2	5	...	...

Year.	Goods, &c., Trains.						Trains not Specified.						Totals.					
	Number of Accidents.		Employés.		Passengers.		Number of Accidents.		Employés.		Passengers.		Number of Accidents.		Employés.		Passengers.	
	Not resulting in Injury.	Resulting in Injury.	Killed.	Injured.	Killed.	Injured.	Not resulting in Injury.	Resulting in Injury.	Killed.	Injured.	Killed.	Injured.	Not resulting in Injury.	Resulting in Injury.	Killed.	Injured.	Killed.	Injured.
1844..	...	2	2	1	...	...	...	...	...	...	...	...	4	6	4	3	...	3
1845...	1	1	1	4	...	...	...	1	...	2	...	...	5	10	4	14	...	12
1846...	4	3	2	5	...	...	...	2	2	1	...	...	7	16	6	15	...	17
1847...	3	2	3	...	...	...	4	...	...	...	...	...	15	16	9	13	5	18
1848...	2	2	2	...	...	...	...	1	...	2	...	...	10	12	7	12	2	12
1849...	...	...	...	...	...	...	...	1	2	...	...	...	3	7	4	1	5	18
1850...	1	2	...	3	...	...	...	...	...	...	...	...	4	10	...	4	...	18
1851...	...	3	4	...	...	...	...	...	...	...	...	...	3	13	8	5	9	48
1852...	...	...	...	...	...	...	...	1	...	2	..	...	1	14	10	11	...	17
Totals	11	15	14	13	...	...	4	6	4	7	...	...	52	104	52	78	21	163

In the preceding Table, XXX., it will be seen in what manner the different kind of trains were affected by the class of accidents now under consideration.

It was found in Table XXV. that the passengers by "express" trains suffered less from the collisions which occurred, than the passengers by other trains. But in regard to the class of accidents in the preceding table, the case is very different; for, from the 18 cases of "running off the line" by express trains, 4 deaths of passengers happened, while from the 93 cases taking place among "mail" and other passenger trains, the number of deaths was 17. In regard, however, to injuries only, the ratio was also less in the case of "express" trains.

The preceding portion of this paper has been confined chiefly to an examination of the manner in which railway accidents have affected passengers, although the tables themselves contain the results of the analysis for employés and other persons not passengers for the time being. Already a large space of the present part of the *Journal* has, however, been devoted to this communication, to the exclusion of some other contributions of an important nature; but this subject will be continued in the next Number, and that portion of it, which was submitted to the Statistical Section of the British Association at Hull brought forward, in which will be investigated, as completely as the data will admit of, the manner in which railway accidents in the United Kingdom during the twelve years, 1840-52, have affected railway servants, and other persons not passengers.

Although the general public is naturally most alive to the manner in which passengers suffer from accidents, still every earnest inquirer must at once sympathize with the dreadful amount of accidents and fearful loss of life to which the servants of Railway Companies are exposed. It is quite impossible not to regard this latter branch of the inquiry as really the more grave and important of the two. Table XII. shows that while in the twelve years ending 1852 the loss of life amongst passengers was 266, that 1,081 deaths took place amongst the employés. This statement is of itself sufficient to prevent the next portion of this Paper from being regarded with indifference.

When the two series of facts have, therefore, been fully brought forward, both as they affect passengers and servants of the companies, it may be then possible to throw some further light on such points as may be calculated to suggest means for lessening a large number of the accidents, and saving the lives of many who would otherwise become victims of the present system of railway management.